ENKAX-1.3

VAX 11730 CLUSTER
EXERCISER

EP-ENKAX-DL-1.3
FICHE 1 OF 4

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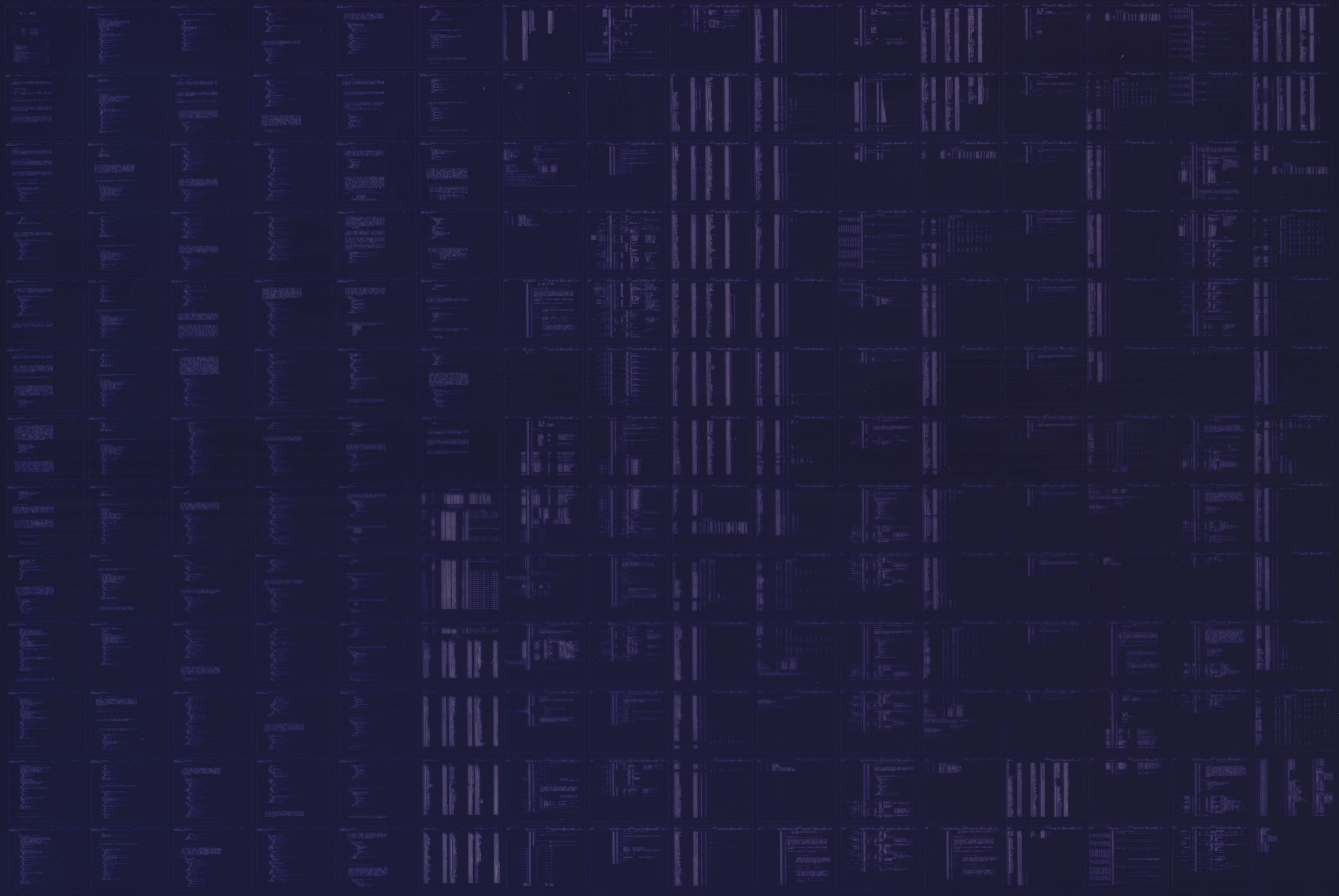

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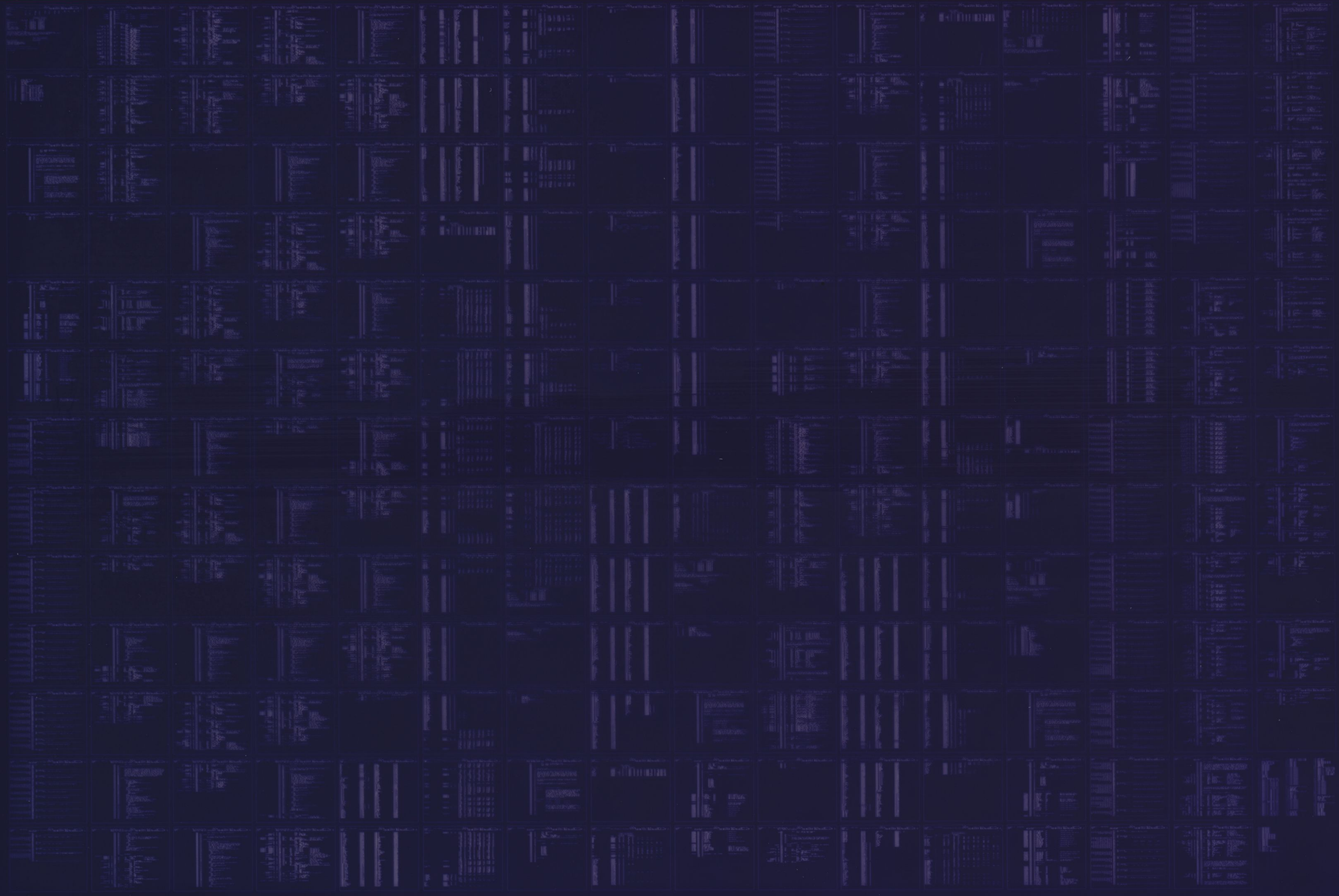

ENKAX-1.3 VAX 11730 CLUSTER EXERCISER EP-ENKAX-DL-1.3
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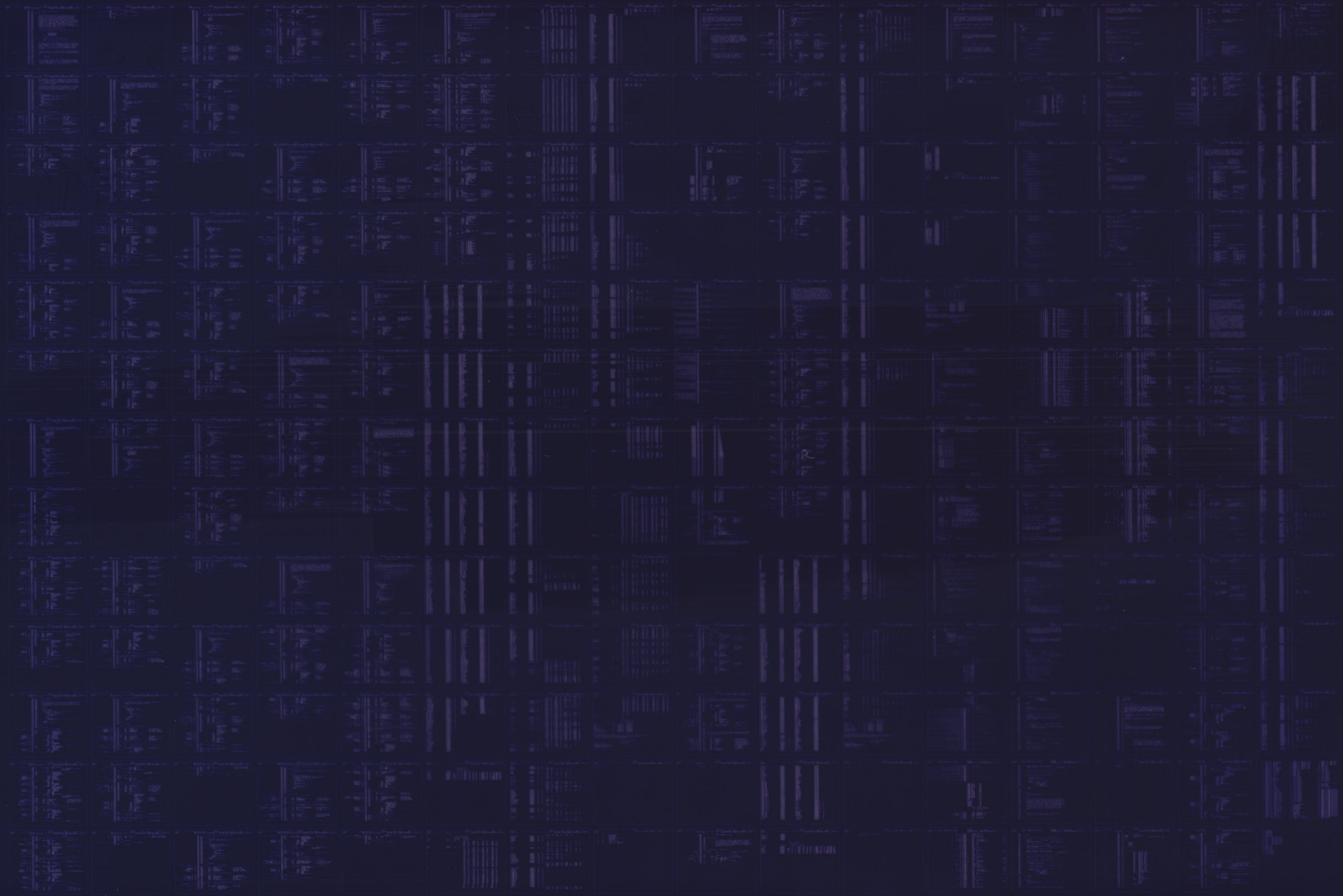

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VAX 11730 CLUSTER
EXERCISER

EP-ENKAX-DL-1.3
FICHE 4 OF 4

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REVISION 1.3 OF
NEBULA Specific CPU Cluster Exerciser

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1.0 ABSTRACT

This program tests portions of the NEBULA CPU cluster hardware which are not specified by the VAX architecture or require manual intervention. This program must run in a standalone environment under control of the Diagnostic Supervisor.

2.0 PROGRAMMING CONVENTIONS

2.1 Implementation Language

This program will be written mostly in VAX assembly language (MACRO) utilizing the Diagnostic Macro Library (DIAG.MLB). The program interfaces to the Diagnostic Supervisor.

2.2 Program Generation

The program modules are assembled individually with MACRO and linked into an executable image using the VAX linker (LINK).

2.3 Transportability

This program is not intended to be run on or transportable to any CPU except the VAX-11/730. Some portions may indeed be found to be transportable, but this program is design to test all parts of the CPU that fall outside the realm of the VAX architecture as defined by the System Reference Manual (SRM).

2.4 Event And Quick Flags

This program implements Event Flag 3 and the Quick Flag. The quick flag is used in Test 7: TU58 EXERCISOR and when set skips subtests 4 - 11 in Test 7 as documented in sections 3.7.2.4 - 3.7.2.11. Event flag 3 when set doesn't read the TU58 SCRAT.CH label and will override the label protection i.e.,write on the tape (providing the TU58 tab is in the write position). If APT is running and event flag 3 is clear and the TU58 is not labeled SCRAT.CH an error will occur.

3.0 DESIGN DESCRIPTION

The NEBULA Specific CPU Cluster Exerciser will be developed using as much as possible from ECKAX (COMET Specific CPU Cluster Exerciser). Due to differences in hardware, some tests will require redesign. All other tests will be developed from scratch because equivalent tests were not developed for the VAX-11/750.

3.1 ENKAXA: RESERVED PROCESSOR REGISTERS

This module tests that all processor register numbers not implemented on the VAX-11/730 will cause a reseved operand fault for a MTPR or MFPR instruction. Also internal processor registers which are write and read only and specific to the VAX-11/730 are checked to not cause reserved operand faults, except in the cases where they should fault.

3.1.1 Reserved Processor Registers

This test checks that processor numbers not used by the VAX-11/730 cause reserve operand faults for the MFPR and MTPR instructions. All read only and write only registers are checked to cause a reserved operand fault when the disallowed function is attempted. (i.e. - write to a read only or read a write only)

3.1.1.1 Reserved Processor Register Numbers

This subtest checks all the reserved processor register numbers that are not used in the VAX-11/730 processor.

Subtest steps:

```
SUBTEST RESERVED PROCESSOR REGISTER NUMBERS
:  Initialize pointer to address table
:  Get reserved operand fault vector to handle exception
:  REPEAT
:  :  Clear error flags
:  :  Get address of register to attempt access
:  :  Attempt MTPR on register
:  :  Check for errors
:  :  IF any errors
:  :  :  THEN
:  :  :  Report error
:  :  :  Exit test
:  :  ENDIF
:  :  Attempt MFPR on register
:  :  Check for errors
```

```
        :  :  IF any errors
        :  :  :  THEN
        :  :  :  Report error
        :  :  :  Exit test
        :  :  ENDIF
        :  :  UNTIL All unused addresses done
        :  ENDREPEAT
        ENDSUBTEST RESERVED PROCESSOR REGISTER NUMBERS
```

3.1.1.2 Read only Processor Registers

This subtest checks processor-specific registers which are read only registers. This subtest attempts a read and checks that a reserved operand fault does not occur. Then an attempt to write the register is made which should cause a reserved operand fault. If an error is encountered it is reported.

Subtest steps:

```
        SUBTEST READ ONLY PROCESSOR REGISTERS
        :  Get reserved operand fault vector to handle exception
        :  REPEAT
        :  :  Clear error flags
        :  :  Attempt MTPR on register
        :  :  Check for errors
        :  :  IF any errors
        :  :  :  THEN
        :  :  :  Report error
        :  :  :  Exit test
        :  :  ENDIF
        :  :  Attempt MFPR on register
        :  :  Check for errors
        :  :  IF any errors
        :  :  :  THEN
        :  :  :  Report error
        :  :  :  Exit test
        :  :  ENDIF
        :  :  UNTIL all read only registers are done
        :  ENDREPEAT
        ENDSUBTEST READ ONLY PROCESSOR REGISTERS
```

3.1.1.3 Write Only Processor Registers

This subtest checks processor-specific registers which are write only registers. This subtest attempts a write and checks that a reserved operand fault does not occur. Then an attempt to read each read only register is made which should cause a reserved operand fault. If an error is encountered it is reported.

Subtest steps:

```
SUBTEST WRITE ONLY PROCESSOR REGISTERS
:  Get reserved operand fault vector to handle exception
:  REPEAT
:  :  Clear error flags
:  :  Attempt MTPR on register
:  :  Check for errors
:  :  IF any errors
:  :  :  THEN
:  :  :  Report error
:  :  :  Exit test
:  :  ENDIF
:  :  Attempt MFPR on register
:  :  Check for errors
:  :  IF any errors
:  :  :  THEN
:  :  :  Report error
:  :  :  Exit test
:  :  ENDIF
:  :  UNTIL all write only registers are done
:  ENDREPEAT
ENDSUBTEST WRITE ONLY PROCESSOR REGISTERS
```

3.2 ENKAXB: ARCHITECTURE ''UNPREDICTABLE'' AND ''UNDEFINED'' OPERATIONS

This module was not implemented for any VAX processor and it was agreed at the Nebula functional specification review that it will not be implemented for the VAX 11/730. The amount of effort required is excessive and the payback in terms of design verification coverage is felt to be minimal.

3.3 ENKAXC: POWER FAIL

This module tests that the VAX-11/730 power failure and recovery mechanism functions properly. The power fail tests instruct the operator to select console panel switch settings and force various power interruptions.

3.3.1 POWER FAIL

This test consists of a series of manual operator intervention subtests. These subtests will check that the Restart Parameter Block (RPB) is recognizable and initiates the proper sequence of events during and after a power failure. The power fail is induced by turning the key switch on the front panel of the 11/730 to the STAND BY position or by opening the BREAKER. With the battery backup on and the select switch in the restart position a warm restart will be attempted after the power is restored.

Assumptions:

For this test to function properly the front panel AUTO RESTART switch must be in the ON position and the battery backup must be on.

3.3.1.1 GOOD RPB SUBTEST

This subtest sets up a good RPB at location zero, which points to a power up routine that restores all pertinent processor registers, the argument pointer, frame pointer and stack pointer. The operator is instructed through the console terminal to turn the key switch on the front panel to the STAND BY position and then back to the local position or open the BREAKER to induce a CPU power failure. If the RPB is interpreted properly the instrucions for the next subtest will be printed on the console terminal. If an error occurred, either the processor will unexpectedly reboot or an error report will be generated by the diagnostic supervisor. This means the RPB was not recognized and a cold restart has been attempted.

SUBTEST STEPS:

```
SUBTEST GOOD RPB
:  Setup good RPB at location 0
:  Send instructions to operator
:  Recover from power fail
:  IF errors
:  :  THEN REPORT errors
:  ENDIF
ENDSUBTEST GOOD RPB
```

3.3.1.2 SEARCH FOR GOOD RPB

This subtest clears the first 1F (^X) memory locations starting with zero to assure that the string of zeros at location 0 will not be misinterpreted as a RPB even though all zeros fills basic criteria for a RPB (i.e., the starting address and checksum of all zeros would be good). It also sets up a good RPB at a higher page boundary which points to a power up routine that restores all pertinent processor registers, the argument pointer, frame pointer and stack pointer. This will test a search through memory to find a valid RPB. The operator is instructed through the console terminal to turn the key switch on the front panel to the STAND BY position or open the BREAKER to induce a CPU power failure. If location zero is misinter- preted as a RPB the processor will halt with code = 1. If the real RPB is interpreted properly the next subtest instructions will be printed on the console terminal. If an error occurred, either the processor will reboot unexpectedly or an error report will be generated by the diagnostic supervisor.

SUBTEST STEPS:

```
SUBTEST SEARCH FOR GOOD RPB
:  Clear first 1F (X) locations
:  Setup good RPB at higher page boundary
:  Send instructions to operator
:  Recover from Power Fail
:  IF any errors
:  :  THEN REPORT errors
:  ENDIF
ENDSUBTEST SEARCH FOR GOOD RPB
```

3.3.1.3 BAD CHECKSUM SUBTEST

This subtest sets up a RPB at location zero with a bad checksum. It points to a power up routine that restores all pertinent processor registers, the argument pointer, frame pointer and stack pointer and will set an error flag indicating that the checksum did not invalidate the RPB. Further into memory a good RPB will be located to warm restart normally without setting an error flag (this prevents an auto cold start). The operator is instructed through the console terminal to turn the key switch on the front panel to the STAND BY position or open the BREAKER to induce a CPU power failure. If the second RPB is not inter- preted properly, the system will attempt a cold restart and boot. If the RPB with the bad checksum causes the warm start an error will be reported.

SUBTEST STEPS:

```
SUBTEST BAD CHECKSUM
:  Setup RPB at location 0 with bad checksum
:  Setup good RPB at higher page boundary
:  Send instructions to operator
:  Recover from power fail
:  IF errors
:  :  THEN REPORT errors
:  ENDIF
ENDSUBTEST BAD CHECKSUM
```

3.4 ENKAXD: PROCESSOR HALT

This module consists of two tests that check the various ways the VAX-11/730 processor can be halted in an ARCHITECTURALLY DEFINED and an ARCHITECTURALLY UNDEFINED manner. These ways include executing a HALT instruction in kernel mode, attempting certain references to an invalid interrupt stack, executing a change mode instruction while on the interrupt stack, executing a change mode instruction which will be serviced on the interrupt stack, SCBB read error, invalid vector, and double machine check halts.

3.4.1 PROCESSOR HALTS ARCH. DEFINED

This test checks the various ways the VAX-11/730 processor can be halted in an architecturally defined manner. This includes executing a HALT instruction in kernel mode, attempting certain references to an invalid interrupt stack and executing change mode instructions when the IS bit of the PSL is set. INSTRUCTIONS FOR EARLY ABORT: If it is desired to exit the test before completion, one must wait for the console prompt (>>>) after the halt occurs and type in the sequence D PC adr <CR> C <CR>, where adr is the absolute address of the label TEST_003_X:: in the program listing.

3.4.1.1 HALT Inst. in Kernel Mode

This subtest checks that the HALT instruction halts the processor when executed in kernel mode (code = 6).

Subtest steps:

```
SUBTEST Halt Instruction in Kernel Mode
:  Initialize Flags
:  Setup code to set done flag at loc 100
:  Setup a jump to READ_GPR at next loc
```

```
        :  Print instructions to operator
        :  Load expected data for stacks
        :  Load GPR's with data
        :  Set ready to execute flag
        :  Execute HALT
        :  IF halt not executed properly
        :  :  THEN
        :  :  (will continue inline execution and get here)
        :  :  Set halt execution error flag
        :  ENDIF
        :  Rentry point (restart will enter here)
        :  Go check FLAGS, PSL, KSP, ISP, SP and GPR's for errors
        :  IF any errors
        :  :  THEN
        :  :  Report errors
        :  ENDIF
        :  IF fatal error
        :  :  THEN
        :  :  Abort test
        :  ENDIF
        ENDSUBTEST Halt instruction in kernel mode
```

3.4.1.2 Interrupt Stack invalid

This subtest checks that an interrupt stack which is located on a page which is protected to kernel read only, will halt the processor when a write is attempted. An XFC instruction is executed to get onto the interrupt stack prior to invalidating the interrupt stack pointer. A second XFC instruction is executed with the vector specifying the interrupt stack for service. When the XFC instruction is executed there is an attempt to write the PC and PSL on the interrupt stack. When this happens an ''Interrupt Stack not valid HALT'' should occur (halt code = 4). Memory management is on for this subtest.

Subtest steps:

```
        SUBTEST Interrupt Stack invalid
        :  Initialize Flags
        :  Turn memory management on
        :  Set page0 protection to kernel write access
        :  IF unsucessful
        :  :  THEN
        :  :  Report system error
        :  :  Abort program
        :  ENDIF
        :  Get XFC vector to handle on interrupt stack
        :  Execute XFC instruction
        :  IF not on the interrupt stack
        :  :  THEN
        :  :  Report system error
        :  :  Abort program
```

```
    :  ENDIF
    :  Release XFC vector
    :  Get XFC vector to handle on interrupt stack
    :  Setup code to set done flag at loc 100
    :  Setup a jump to READ_GPR at next loc
    :  Save current IS SP to reset after subtest is complete
    :  Set interrupt stack pointer to buffer area
    :  Invalidate buffer page (kernel read only access)
    :  IF unsucessful
    :  :  THEN
    :  :  Report system error
    :  :  Abort program
    :  ENDIF
    :  Print instructions to operator
    :  Setup all expected data
    :  Load GPR's with data
    :  Set ready to execute flag
    :  Execute XFC to attempt to write PC and PSL on IS
    :  (this should cause an interrupt stack not valid HALT)
    :  IF XFC not executed properly
    :  :  THEN
    :  :  (will continue in line execution and get here)
    :  :  Set XFC execution error flag
    :  ENDIF
    :  Rentry point (restart will enter here)
    :  Read PSL
    :  IF on IS as expected
    :  :  THEN
    :  :  Restore IS SP
    :  ENDIF
    :  Go check FLAGS, PSL, KSP, ISP, SP and GPR'S for errors
    :  (Either the KSP or ISP will be UNPREDICTABLE depending on the
    :  current stack, this is machine dependant)
    :  IF any errors
    :  :  THEN
    :  :  Report errors
    :  ENDIF
    :  IF fatal error
    :  :  THEN
    :  :  Abort program
    :  ENDIF
    :  Reset protection on buffer page to original protection
    :  Turn memory management off
    :  Release XFC vector
    ENDSUBTEST Interrupt Stack invalid
```

3.4.1.3 IS SP points to NXM

This subtest checks that an interrupt stack, stack pointer which points to nonexistent memory will halt the processor. Memory management is off for this subtest and an Interrupt Stack not valid HALT should occur (code = 4).

Subtest steps:

```
SUBTEST IS points to NXM
:  Initialize Flags
:  Setup code to set done flag at loc 100
:  Save current IS SP
:  Setup a jump to RENTRY point at next loc
:  Get XFC vector to handle on interrupt stack
:  Execute XFC instruction
:  IF not on the interrupt stack
:  :  THEN
:  :  Report system error
:  :  Abort program
:  ENDIF
:  Release XFC vector
:  Get XFC vector for service on the interrupt stack
:  Print instructions to operator
:  Point interrupt stack pointer to NXM
:  Setup all expected data
:  Load GPR's with data
:  Set ready to execute flag
:  Execute XFC which will write PC and PSL on IS
:  (this should cause an interrupt stack not valid HALT)
:  IF XFC not executed (will continue and get here)
:  :  THEN
:  :  Set XFC execution error flag
:  ENDIF
:  RENTRY point (restart will enter here)
:  Read PSL
:  IF on IS stack as expected
:  :  THEN
:  :  Restore IS SP
:  ENDIF
:  Go check FLAGS, PSL, KSP, ISP, SP and GPR's for errors
:  IF any errors
:  :  THEN
:  :  Report errors
:  ENDIF
:  IF fatal error
:  :  THEN
:  :  Abort test
:  ENDIF
:  Release XFC vector
ENDSUBTEST IS points to NXM
```

3.4.1.4 CHMU inst. with PSL<IS>=1

This subtest checks that a CHMU instruction with PSL<IS>=1, will cause the processor to HALT (code = A).

Subtest steps:

```
SUBTEST CHMU instruction with PSL<IS>=1
:  Initialize Flags
:  Get XFC vector to handle exception on interrupt stack
:  Get CHMU vector in case CHMU instruction does execute
:  Setup code to set done flag at loc 100
:  Setup code to jump to READ_GPR point in next loc
:  Print restart instructions to operator
:  Execute an XFC instruction to get on interrupt stack
:  Read current PSL
:  IF NOT on interrupt stack
:  :  THEN
:  :  Report wrong stack error
:  :  Abort test
:  ENDIF
:  Setup all expected data
:  Load GPR's with data
:  Set ready to execute flag
:  Execute CHMU to cause processor to HALT
:  (this should cause a CHMU on interrupt stack HALT)
:  IF CHMU does not caues an exception
:  :  THEN
:  :  Set execution error flag
:  ENDIF
:  RENTRY point (restart enters here from exception)
:  Go check FLAGS, PSL, KSP, ISP, SP and GPR's for errors
:  IF any errors
:  :  THEN
:  :  Report errors
:  ENDIF
:  IF fatal error
:  :  THEN
:  :  Abort test
:  ENDIF
:  Modify PC on stack to point to second RENTRY point
:  Execute REI to get back to correct stack
:  Second RENTRY point
:  Read PSL
:  IF not on kernel stack
:  :  THEN
:  :  Report incorrect stack error
:  :  Abort test
:  ENDIF
:  Release interval timer vector
:  Release CHMU vector
:  Release XFC vector
ENDSUBTEST CHMU instruction with PSL<IS>=1
```

3.4.1.5 CHMS inst. with PSL<IS>=1

This subtest checks that a CHMS instruction with PSL<IS>=1, will cause the processor to HALT (code = A).

Subtest steps:

```
SUBTEST CHMS instruction with PSL<IS>=1
:  Initialize Flags
:  Get XFC vector to handle exception on interrupt stack
:  Get interval timer vector to prevent outside interrupts
:  Get CHMS vector in case CHMS instruction does execute
:  Setup code to set done flag at loc 100
:  Setup code to jump to RENTRY point in next loc
:  Print restart instructions to operator
:  Execute an XFC instruction to get on interrupt stack
:  Read current PSL
:  IF NOT on interrupt stack
:  :  THEN
:  :  Report wrong stack error
:  :  Exit test
:  ENDIF
:  Set ready to execute flag
:  Execute CHMS to cause processor to HALT
:  (this should cause a CHMS on interrupt stack HALT)
:  IF CHMS does not caues an exception
:  :  THEN
:  :  Set exception error flag
:  ENDIF
:  RENTRY point (restart enters here from exception)
:  IF exception error flag set
:  :  THEN
:  :  Report CHMS exception error
:  :  Exit test
:  ENDIF
:  IF CHMS instruction executed flag set
:  :  THEN
:  :  Report change mode error
:  :  Exit test
:  ENDIF
:  IF done flag not set
:  :  THEN
:  :  Report done error
:  :  Exit test
:  ENDIF
:  Modify PC on stack to point to RENTRY2
:  Execute REI to get back to correct stack
:  RENTRY2 point
:  Read PSL
:  IF IS not clear
:  :  THEN
:  :  Report incorrect stack error in clean up
:  :  Exit test
:  ENDIF
:  Release interval timer vector
:  Release CHMS vector
:  Release XFC vector
ENDSUBTEST CHMS instruction with PSL<IS>=1
```

3.4.1.6 CHME inst. with PSL<IS>=1

This subtest checks that a CHME instruction with PSL<IS>=1, will cause the processor to HALT (code = A).

Subtest steps:

```
SUBTEST CHME instruction with PSL<IS>=1
:  Initialize Flags
:  Get XFC vector to handle exception on interrupt stack
:  Get interval timer vector to prevent outside interrupts
:  Get CHME vector in case CHME instruction does execute
:  Setup code to set done flag at loc 100
:  Setup code to jump to RENTRY point in next loc
:  Print restart instructions to operator
:  Execute an XFC instruction to get on interrupt stack
:  Read current PSL
:  IF NOT on interrupt stack
:  :  THEN
:  :  Report wrong stack error
:  :  Exit test
:  ENDIF
:  Set ready to execute flag
:  Execute CHME to cause processor to HALT
:  (this should cause a CHME on interrupt stack HALT) .
:  IF CHME does not caues an exception
:  :  THEN
:  :  Set exception error flag
:  ENDIF
:  RENTRY point (restart enters here from exception)
:  IF exception error flag set
:  :  THEN
:  :  Report CHME exception error
:  :  Exit test
:  ENDIF
:  IF CHME instruction executed flag set
:  :  THEN
:  :  Report change mode error
:  :  Exit test
:  ENDIF
:  IF done flag not set
:  :  THEN
:  :  Report done error
:  :  Exit test
:  ENDIF
:  Modify PC on stack to point to RENTRY2
:  Execute REI to get back to correct stack
:  RENTRY2 point
:  Read PSL
:  IF IS not clear
:  :  THEN
:  :  Report incorrect stack error in clean up
:  :  Exit test
:  ENDIF
:  Release interval timer vector
```

```
        :  Release CHME vector
        :  Release XFC vector
        ENDSUBTEST CHME instruction with PSL<IS>=1
```

3.4.1.7 CHMK inst. with PSL<IS>=1

This subtest checks that a CHMK instruction with PSL<IS>=1, will cause the processor to HALT (code = A).

Subtest steps:

```
        SUBTEST CHMK instruction with PSL<IS>=1
        :  Initialize Flags
        :  Get XFC vector to handle exception on interrupt stack
        :  Get interval timer vector to prevent outside interrupts
        :  Get CHMK vector in case CHMK instruction does execute
        :  Setup code to set done flag at loc 100
        :  Setup code to jump to RENTRY point in next loc
        :  Print restart instructions to operator
        :  Execute an XFC instruction to get on interrupt stack
        :  Read current PSL
        :  IF NOT on interrupt stack
        :  :  THEN
        :  :  Report wrong stack error
        :  :  Exit test
        :  ENDIF
        :  Set ready to execute flag
        :  Execute CHMK to cause processor to HALT
        :  (this should cause a CHMK on interrupt stack HALT)
        :  IF CHMK does not caues an exception
        :  :  THEN
        :  :  Set exception error flag
        :  ENDIF
        :  RENTRY point (restart enters here from exception)
        :  IF exception error flag set
        :  :  THEN
        :  :  Report CHMK exception error
        :  :  Exit test
        :  ENDIF
        :  IF CHMK instruction executed flag set
        :  :  THEN
        :  :  Report change mode error
        :  :  Exit test
        :  ENDIF
        :  IF done flag not set
        :  :  THEN
        :  :  Report done error
        :  :  Exit test
        :  ENDIF
        :  Modify PC on stack to point to RENTRY2
        :  Execute REI to get back to correct stack
        :  RENTRY2 point
```

```
          : Read PSL
          : IF IS not clear
          : : THEN
          : : Report incorrect stack error in clean up
          : : Exit test
          : ENDIF
          : Release interval timer vector
          : Release CHMK vector
          : Release XFC vector
          ENDSUBTEST CHMK instruction with PSL<IS>=1
```

3.4.2 PROCESSOR HALTS ARCH. UNDEFINED

This test checks the various ways the VAX-11/730 processor can be halted in an architecturally undefined manner. This includes change mode instructions with the vector specifying service on the interrupt stack, invalid vector halt, SCBB read error halt, double machine check halt, and transfer to NXM user WCS halt. INSTRUCTIONS FOR EARLY ABORT: If it is desired to exit the test before completion, one must wait for the console prompt (>>>) after the halt occurs and type in the sequence D PC adr <CR> C <CR>, where adr is the absolute address of the label TEST_004_X:: in the program listing.

3.4.2.1 CHMU inst. with vector service on IS

This subtest checks that a CHMU instruction with the SCB vector entry <1:0>=1 specifying service on the interrupt stack will cause the processor to HALT (code = B).

Subtest steps:

```
          SUBTEST CHMU instruction with vector service on IS
          : Initialize Flags
          : Get interval timer vector to prevent outside interrupts
          : Get CHMU vector specifying service on IS
          : Setup code to set done flag at loc 100
          : Setup code to jump to RENTRY point in next loc
          : Print restart instructions to operator
          : Set ready to execute flag
          : Execute CHMU to cause processor to HALT
          : (this should cause a CHMU service on interrupt stack HALT)
          : IF CHMU does not caues an exception
          : : THEN
          : : Set exception error flag
          : ENDIF
          : RENTRY point (restart enters here from exception)
          : IF exception error flag set
          : : THEN
```

```
:  :  Report CHMU exception error
:  :  Exit test
:  ENDIF
:  IF CHMU instruction executed flag set
:  :  THEN
:  :  Report change mode error
:  :  Exit test
:  ENDIF
:  IF done flag not set
:  :  THEN
:  :  Report done error
:  :  Exit test
:  ENDIF
:  Read PSL
:  IF IS not clear
:  :  THEN
:  :  Report incorrect stack error in clean up
:  :  Exit test
:  ENDIF
:  Release interval timer vector
:  Release CHMU vector
ENDSUBTEST CHMU instruction with
```

3.4.2.2 CHMS inst. with vector service on IS

This subtest checks that a CHMS instruction with the SCB vector entry <i:0>=1 specifying service on the interrupt stack will cause the processor to HALT (code = B).

Subtest steps:

```
SUBTEST CHMS instruction with vector service on IS
:  Initialize Flags
:  Get interval timer vector to prevent outside interrupts
:  Get CHMS vector specifying service on IS
:  Setup code to set done flag at loc 100
:  Setup code to jump to RENTRY point in next loc
:  Print restart instructions to operator
:  Set ready to execute flag
:  Execute CHMS to cause processor to HALT
:  (this should cause a CHMS service on interrupt stack HALT)
:  IF CHMS does not caues an exception
:  :  THEN
:  :  Set exception error flag
:  ENDIF
:  RENTRY point (restart enters here from exception)
:  IF exception error flag set
:  :  THEN
:  :  Report CHMS exception error
:  :  Exit test
:  ENDIF
:  IF CHMS instruction executed flag set
: :  THEN
: :  Report change mode error
: :  Exit test
:  ENDIF
:  IF done flag not set
: :  THEN
: :  Report done error
: :  Exit test
:  ENDIF
:  Read PSL
:  IF IS not clear
: :  THEN
: :  Report incorrect stack error in clean up
: :  Exit test
:  ENDIF
:  Release interval timer vector
:  Release CHMS vector
ENDSUBTEST CHMS instruction with
```

3.4.2.3 CHME inst. with vector service on IS

This subtest checks that a CHME instruction with the SCB vector entry <1:0>=1 specifying service on the interrupt stack will cause the processor to HALT (code = B).

Subtest steps:

```
SUBTEST CHME instruction with vector service on IS
:  Initialize Flags
:  Get interval timer vector to prevent outside interrupts
:  Get CHME vector specifying service on IS
:  Setup code to set done flag at loc 100
:  Setup code to jump to RENTRY point in next loc
:  Print restart instructions to operator
:  Set ready to execute flag
:  Execute CHME to cause processor to HALT
:  (this should cause a CHME service on interrupt stack HALT)
:  IF CHME does not caues an exception
: :  THEN
: :  Set exception error flag
:  ENDIF
:  RENTRY point (restart enters here from exception)
:  IF exception error flag set
: :  THEN
: :  Report CHME exception error
: :  Exit test
:  ENDIF
:  IF CHME instruction executed flag set
: :  THEN
: :  Report change mode error
: :  Exit test
:  ENDIF
```

```
          :  IF done flag not set
          :  :  THEN
          :  :  Report done error
          :  :  Exit test
          :  ENDIF
          :  Read PSL
          :  IF IS not clear
          :  :  THEN
          :  :  Report incorrect stack error in clean up
          :  :  Exit test
          :  ENDIF
          :  Release interval timer vector
          :  Release CHME vector
          ENDSUBTEST CHME instruction with
```

3.4.2.4 CHMK inst. with vector service on IS

This subtest checks that a CHMK instruction with the SCB vector entry <1:0>=1 specifying service on the interrupt stack will cause the processor to HALT (code = B).

Subtest steps:

```
          SUBTEST CHMK instruction with vector service on IS
          :  Initialize Flags
          :  Get interval timer vector to prevent outside interrupts
          :  Get CHMK vector specifying service on IS
          :  Setup code to set done flag at loc 100
          :  Setup code to jump to RENTRY point in next loc
          :  Print restart instructions to operator
          :  Set ready to execute flag
          :  Execute CHMK to cause processor to HALT
          :  (this should cause a CHMK service on interrupt stack HALT)
          :  IF CHMK does not caues an exception
          :  :  THEN
          :  :  Set exception error flag
          :  ENDIF
          :  RENTRY point (restart enters here from exception)
          :  IF exception error flag set
          :  :  THEN
          :  :  Report CHMK exception error
          :  :  Exit test
          :  ENDIF
          :  IF CHMK instruction executed flag set
          :  :  THEN
          :  :  Report change mode error
          :  :  Exit test
          :  ENDIF
          :  IF done flag not set
          :  :  THEN
          :  :  Report done error
          :  :  Exit test
```

```
        :  ENDIF
        :  Read PSL
        :  IF IS not clear
        :  :  THEN
        :  :  Report incorrect stack error in clean up
        :  :  Exit test
        :  ENDIF
        :  Release interval timer vector
        :  Release CHMK vector
        ENDSUBTEST CHMK instruction with
```

3.4.2.5 Invalid vector HALT

This subtest checks that an XFC instruction with the SCB vector entry <1:0>=3 specifying an invalid vector will cause the processor to HALT (code = 7).

Subtest steps:

```
        SUBTEST Invalid vector HALT
        :  Initialize Flags
        :  Get interval timer vector to prevent outside interrupts
        :  Get XFC vector bits <1:0> = 3 (invalid vector)
        :  Setup code to set done flag at loc 100
        :  Setup code to jump to RENTRY point in next loc
        :  Print restart instructions to operator
        :  Set ready to execute flag
        :  Execute XFC to cause processor to HALT
        :  (this should cause a invalid vector HALT)
        :  IF XFC does not caues an exception
        :  :  THEN
        :  :  Set exception error flag
        :  ENDIF
        :  RENTRY point (restart enters here from exception)
        :  IF exception error flag set
        :  :  THEN
        :  :  Report XFC exception error
        :  :  Exit test
        :  ENDIF
        :  IF XFC instruction executed flag set
        :  :  THEN
        :  :  Report XFC error
        :  :  Exit test
        :  ENDIF
        :  IF done flag not set
        :  :  THEN
        :  :  Report done error
        :  :  Exit test
        :  ENDIF
        :  Read PSL
        :  IF IS not clear
        :  :  THEN
        :  :  Report incorrect stack error in clean up
        :  :  Exit test
        :  ENDIF
        :  Release interval timer vector
        :  Release XFC vector
        ENDSUBTEST Invalid vector HALT
```

3.4.2.6 SCBB read error HALT

This subtest checks that if the SCBB points to NXM, when an exception occurs the processor will HALT (code = C).

Subtest steps:

```
        SUBTEST SCBB read error HALT
        :  Initialize Flags
        :  Get interval timer vector to prevent outside interrupts
        :  Get XFC vector
        :  Point SCBB to NXM
        :  Setup code to set done flag at loc 100
        :  Setup code to jump to RENTRY point in next loc
        :  Print restart instructions to operator
        :  Set ready to execute flag
        :  Execute XFC to cause processor to HALT
        :  (this should cause an SCBB read error HALT)
        :  IF XFC does not caues an exception
        :  :  THEN
        :  :  Set exception error flag
        :  ENDIF
        :  RENTRY point (restart enters here from exception)
        :  IF exception error flag set
        :  :  THEN
        :  :  Report XFC exception error
        :  :  Exit test
        :  ENDIF
        :  IF XFC instruction executed flag set
        :  :  THEN
        :  :  Report SCBB error
        :  :  Exit test
        :  ENDIF
        :  IF done flag not set
        :  :  THEN
        :  :  Report done error
        :  :  Exit test
        :  ENDIF
        :  Read PSL
        :  IF IS not clear
        :  :  THEN
        :  :  Report incorrect stack error in clean up
        :  :  Exit test
        :  ENDIF
        :  Release interval timer vector
        :  Release XFC vector
        ENDSUBTEST SCBB read error HALT
```

3.4.2.7 Double machine check HALT

This subtest checks that a double machine check halt will be generated if a second machine check occurs before a previous machine check has been serviced. (code=5)

Subtest steps:

```
        SUBTEST Double machine check HALT
        :  Initialize Flags
        :  Get interval timer vector to prevent outside interrupts
        :  Point machine check vector to NXM location
        :  Setup code to set done flag at loc 100
        :  Setup code to jump to RENTRY point in next loc
        :  Print restart instructions to operator
        :  Set ready to execute flag
        :  Reference NXM to cause machine check and thus a halt
        :  IF NXM does not cause an exception
        :  :  THEN
        :  :  Set exception error flag
        :  ENDIF
        :  RENTRY point (restart enters here from exception)
        :  IF exception error flag set
        :  :  THEN
        :  :  Report NXM exception error
        :  :  Exit test
        :  ENDIF
        :  IF done flag not set
        :  :  THEN
        :  :  Report done error
        :  :  Exit test
        :  ENDIF
        :  Release machine check vector
        :  Release interval timer vector
        ENDSUBTEST Double machine check HALT
```

3.4.2.8 Transfer to NXM USER WCS

This subtest will attempt to cause a transfer to NXM USER WCS HALT by checking the p-table for a response to ''USER WCS loaded?''. If a ''no'' response is found then this test will execute and attempt to envoke microcode that has not been loaded into WCS. (code=8)

Subtest steps:

```
SUBTEST Transfer to NXM USER WCS HALT
:  Check p table for USER WCS not loaded
:  IF loaded
:  :  THEN
:  :  Exit subtest
:  ENDIF
:  Initialize Flags
:  Get interval timer vector to prevent outside interrupts
:  Get XFC vector to service in WCS
:  Setup code to set done flag at loc 100
:  Setup code to jump to RENTRY point in next loc
:  Print restart instructions to operator
:  Set ready to execute flag
:  Execute XFC to cause processor to HALT
:  (this should cause a transfer to NXM USER WCS HALT)
:  IF XFC does not caues an exception
:  :  THEN
:  :  Set exception error flag
:  ENDIF
:  RENTRY point (restart enters here from exception)
:  IF exception error or instruction executed flags set
:  :  THEN
:  :  Report XFC exception error
:  :  Exit test
:  ENDIF
:  IF done flag not set
:  :  THEN
:  :  Report done error
:  :  Exit test
:  ENDIF
:  Read PSL
:  IF IS not clear
:  :  THEN
:  :  Report incorrect stack error in clean up
:  :  Exit test
:  ENDIF
:  Release interval timer vector
:  Release XFC vector
ENDSUBTEST Transfer to NXM USER WCS HALT
```

3.5 ENKAXE: WRITABLE CONTROL STORE

It was agreed at the Nebula functional specification review that this module will not be implemented for the VAX 11/730 due to the requirements to load WCS with executable code and the inablity for a MACRO program to access WCS. To implement this test would require a special TU58 micro code tape with an additional file containing any micro code that would be used in this test. If WCS were accessible to a MACRO program, as it is in the VAX 11/780 and VAX 11/750, this test would be more feasible.

3.6 ENKAXF: MACHINE CHECK EXCEPTIONS

This module tests some of the possible ways in which a machine check exception may occure.

3.6.1 Machine Check Exceptions

This test checks that a reference to NXM, unaligned reference to I/O space, illegal I/O space address, and illegal UNIBUS reference will cause machine checks with the proper logout information.

3.6.1.1 Reference to NXM

This subtest attempts to read a nonexistent memory location, which should cause a machine check. The machine check logout pushed on the stack is checked for the correct information.

Subtest steps:

```
SUBTEST Reference to NXM
:  Get Machine Check vector to capture exception
:  IF unsucessful
:  :  THEN
:  :  Report system error
:  :  Abort test
:  ENDIF
:  Setup expected data and load GPR's with data
:  Set ready to execute flag
:  Access nonexistent memory (to cause exception)
:  Set execution error flag
:  IF no exception
:  :  THEN
:  :  Set execution error flag
:  ENDIF
:  Check machine check logout and register data
:  IF error is detected
```

```
         :  :  THEN
         :  :  Report data error
         :  ENDIF
         :  IF fatal error flag is set
         :  :  THEN
         :  :  Abort test
         :  ENDIF
         :  Release Machine Check vector
         :  IF unsucessful
         :  :  THEN
         :  :  Report system error
         :  :  Abort test
         :  ENDIF
         :  Push return PC and PSL on stack
         :  Execute an REI
        ENDSUBTEST Reference to NXM
```

3.6.1.2 Unaligned reference to I/O space

This subtest attempts an unaligned reference to I/O space and checks that a machine check occurs with the correct logout information on the stack.

Subtest steps:

```
        SUBTEST Unaligned reference to I/O space
         :  Get Machine Check vector to capture exception
         :  IF unsucessful
         :  :  THEN
         :  :  Report system error
         :  :  Abort test
         :  ENDIF
         :  Setup expected data and load GPR's with data
         :  Set ready to execute flag
         :  Access unaligned I/O space (to cause exception)
         :  Set execution error flag
         :  IF no exception
         :  :  THEN
         :  :  Set execution error flag
         :  ENDIF
         :  Check machine check logout and register data
         :  IF error is detected
         :  :  THEN
         :  :  Report data error
         :  ENDIF
         :  IF fatal error flag is set
         :  :  THEN
         :  :  Abort test
         :  ENDIF
         :  Release Machine Check vector
         :  IF unsucessful
         :  :  THEN
         :  :  Report system error
         :  :  Abort test
        :  ENDIF
        :  Push return PC and PSL on stack
        :  Execute an REI
        ENDSUBTEST Unaligned reference to I/O space
```

3.6.1.3 Illegal I/O space address

This subtest attempts an illegal reference to I/O space and checks that a machine check occurs with the correct logout information on the stack.

Subtest steps:

```
        SUBTEST Illegal I/O space address
        :  Get Machine Check vector to capture exception
        :  IF unsucessful
        :  :  THEN
        :  :  Report system error
        :  :  Abort test
        :  ENDIF
        :  Setup expected data and load GPR's with data
        :  Set ready to execute flag
        :  Access illegal I/O space (to cause exception)
        :  Set execution error flag
        :  IF no exception
        :  :  THEN
        :  :  Set execution error flag
        :  ENDIF
        :  Check machine check logout and register data
        :  IF error is detected
        :  :  THEN
        :  :  Report data error
        :  ENDIF
        :  IF fatal error flag is set
        :  :  THEN
        :  :  Abort test
        :  ENDIF
        :  Release Machine Check vector
        :  IF unsucessful
        :  :  THEN
        :  :  Report system error
        :  :  Abort test
        :  ENDIF
        :  Push return PC and PSL on stack
        :  Execute an REI
        ENDSUBTEST Illegal I/O space address
```

3.6.1.4 Illegal UNIBUS reference

This subtest attempts an illegal UNIBUS reference and checks that a machine check occurs with the correct logout information on the stack.

Subtest steps:

```
SUBTEST Illegal UNIBUS reference
:  Get Machine Check vector to capture exception
:  IF unsucessful
:  :  THEN
:  :  Report system error
:  :  Abort test
:  ENDIF
:  Setup expected data and load GPR's with data
:  Set ready to execute flag
:  Access illegal UNIBUS address (to cause exception)
:  Set execution error flag
:  IF no exception
:  :  THEN
:  :  Set execution error flag
:  ENDIF
:  Check machine check logout and register data
:  IF error is detected
:  :  THEN
:  :  Report data error
:  ENDIF
:  IF fatal error flag is set
:  :  THEN
:  :  Abort test
:  ENDIF
:  Release Machine Check vector
:  IF unsucessful
:  :  THEN
:  :  Report system error
:  :  Abort test
:  ENDIF
:  Push return PC and PSL on stack
:  Execute an REI
ENDSUBTEST Illegal UNIBUS reference
```

3.7 ENKAXG: TU58 EXERCISER

This module exercises the TU58 tape controller to assure basic functionality. A series of subtests, including the controller's self test are executed checking initialize, no operation, write, read, seek, write modified, read modified, head switching and positioning. This test will

3.7.1 TU58 EXERCISER

This test exercises the TU58 on the VAX-11/730 by performing initialization, self diagnostic and no operation. All information received from the TU58 is checked for errors. All errors detected are reported. All data transfers will be expected to execute in Modified Radial Serial Protocol (MRSP).

Assumptions:

This subtest does not write or read the TU58. All operations performed deal with the controller only. (NOTE: Test 2 requires a scratch tape).

3.7.1.1 INITIALIZE

This subtest sends the TU58 a command packet to perform an initialization operation which puts the controller into a known ready state. While sending each byte of the packet, a timer is set which will time out if the ready bit in the transmitter processor register does not set within the alloted time. The same is done for the done bit in the receiver processor register while reading a byte from the TU58. When this is completed successfully, the returned end packet is compared to an expected end packet. If a time out occurs or bad data is encountered an error will be reported.

Subtest steps:

```
SUBTEST INITIALIZE
:  Clear buffer
:  Point to initialize command packet
:  REPEAT
:  :  Send command packet byte at a time
:  :  Set timer
:  :  IF timer expired AND no response
:  :  :  THEN
:  :  :  Report no response error
:  :  :  Exit test
:  :  ENDIF
:  :  UNTIL all bytes sent
```

```
            :  ENDREPEAT
            :  REPEAT
            :  :  Set timer
            :  :  IF timer expired AND done set
            :  :  :  THEN
            :  :  :  :  Read byte
            :  :  ENDIF
            :  :  UNTIL timer expired AND done clear
            :  ENDREPEAT
#           :  IF expected byte count NEQ actual byte count
#           :  :  THEN
#           :  :  :  Report error
            :  :  :  Exit test
#           :  ENDIF
            :  Point to expected and actual end packet
            :  REPEAT
            :  :  IF data expected NEQ data received
            :  :  :  THEN
            :  :  :  Report error
            :  :  :  Exit test
            :  :  ENDIF
            :  :  UNTIL all data checked
            :  ENDREPEAT
            ENDSUBTEST INITIALIZE
```

3.7.1.2 SELF DIAGNOSTIC

This subtest sends the TU58 a command packet to run its internal diagnostic. While sending each byte of the packet,a timer is set which will time out if the ready bit in the transmitter processor register does not set within the alloted time. The same is done for the done bit in the receiver processor register while reading a byte from the TU58. When this is completed successfully, the returned end packet is compared to an expected end packet. If a time out occurs or bad data is encountered an error will be reported.

Subtest steps:

```
SUBTEST SELF DIAGNOSTIC
:  Clear buffer
:  Point to self diagnostic command packet
:  REPEAT
:  :  Send command packet byte at a time
:  :  Set timer
:  :  IF timer expired AND no response
:  :  :  THEN
:  :  :  Report no response error
:  :  :  Exit test
:  :  ENDIF
:  :  UNTIL all bytes sent
:  ENDREPEAT
```

```
             :  REPEAT
             :  :  Set timer
             :  :  IF timer expired AND done set
             :  :  :  THEN
             :  :  :  :  Read byte
             :  :  ENDIF
             :  :  UNTIL timer expired AND done clear
             :  ENDREPEAT
#            :  IF expected byte count NEQ actual byte count
#            :  :  THEN
             :  :  :  Report error
#            :  :  :  Exit test
#            :  ENDIF
             :  Point to expected and actual data
             :  REPEAT
             :  :  IF expected data NEQ received data
             :  :  :  THEN
             :  :  :  Report data error
             :  :  :  Exit test
             :  :  ENDIF
             :  :  UNTIL all data checked
             :  ENDREPEAT
            ENDSUBTEST SELF DIAGNOSTIC
```

3.7.1.3 NOP

This subtest sends the TU58 a command packet to perform a no operation. While sending each byte of the packet, a timer is set which will time out if the ready bit in the transmitter processor register does not set within the alloted time. The same is done for the done bit in the receiver processor register while reading a byte from the TU58. When this is completed successfully, the returned end packet is compared to an expected end packet. If a time out occurs while expecting a byte transfer or bad data is encountered an error will be reported.

Subtest steps:

```
            SUBTEST NOP
             :  Clear buffer
             :  Point to no operation command packet
             :  REPEAT
             :  :  Send command packet byte at a time
             :  :  Set timer
             :  :  IF timer expired AND no response
             :  :  :  THEN
             :  :  :  Report no response error
             :  :  :  Exit test
             :  :  ENDIF
             :  :  UNTIL all bytes sent
             :  ENDREPEAT
             :  REPEAT
```

```
          :  :  Set timer
          :  :  IF timer expired AND done set
          :  :  :  THEN
          :  :  :  :  Read byte
          :  :  ENDIF
          :  :  UNTIL timer expired AND done clear
          :  ENDREPEAT
#         :  IF expected byte count NEQ actual byte count
#         :  :  THEN
#         :  :  :  Report error
          :  :  :  Exit test
#         :  ENDIF
          :  Point to expected and actual end packet
          :  REPEAT
          :  :  IF expected data NEQ received data
          :  :  :  THEN
          :  :  :  Report data error
          :  :  :  Exit test
          :  :  ENDIF
          :  :  UNTIL all data checked
          :  ENDREPEAT
          ENDSUBTEST NOP
```

3.7.2 TU58 EXERCISER READ/WRITE

This test exercises the TU58 on the VAX-11/730 by performing position, read (normal and two versions of modified) and write (normal and two versions of modified) commands. Zero padding of blocks and records are also checked for write commands. All end and data packets are checked for errors. Timers are setup to time out if a byte transaction between the host and TU58 is not completed within a reasonable amount of time. If any errors are detected, they are reported with all available information pertaining to the failure.

Assumptions:

This test assumes the scratch tape cartridge used is in good condition. If a marginal tape is used bits may be dropped during the read modified test, which reads with an increased threshold and will consequently report false data errors. Any tape may be used, but existing data will be destroyed. Before the tape is written, the first directory will be read. If the directory read is not "scrat.ch", the operator will be prompted to either overwrite the tape or abort this test. If overwriting the tape is chosen, an attempt to write "scrat.ch" in the first directory area will be made. If an operational error occurs it will be reported, but error detection in this subtest is limited and the primary function is to give the operator an opportunity to remove a tape containing valuable data from the drive and inserting a scratch tape before it is destroyed. All transfers will be expected to execute in Modified Radial Serial Protocol (MRSP).

3.7.2.1 READ DIRECTORY

This subtest sends the TU58 a command packet to read the first entry in the directory area of the tape. A timer is set which will time out if the ready bit in the transmitter processor register does not set within the allotted time. A second timer is set which will time out if the done bit in the receiver processor register does not set within the allotted amount of time. If either of these timers expires while expecting a data transfer an error will be reported stating the conditions existing at the time of failure. The returned data packet is examined to see if the directory on the tape is ``scrat.ch''. If it is a scratch tape testing continues; if not, the operator will be prompted to either abort the TU58 exerciser test or overwrite the tape in the drive. Before entering the appropriate response on the TTY, the tape cartridge may be replaced with a scratch tape. In the case of an overwrite, the TU58 will be sent a write command packet to write ``scrat.ch'' in the directory. Timers are set which will time out if the appropriate bits do not set within allotted times. If an error occurs all appropriate information will be reported. This subtest is not primarily used for error detection, if an error is encountered, testing should continue with the next subtest for diagnosis.

Subtest steps:

```
        SUBTEST READ DIRECTORY
        :  Clear buffer
        :  Point to read command packet
        :  REPEAT
        :  :  Send byte of command packet
        :  :  Set timer
        :  :  IF no response AND timer expired
        :  :  :  THEN
        :  :  :  Report no response error
        :  :  :  Exit test
        :  :  ENDIF
        :  :  UNTIL all bytes sent
        :  ENDREPEAT
        :  REPEAT
        :  :  Set timer
        :  :  IF timer expired AND done set
        :  :  :  THEN
        :  :  :  :  Read byte
        :  :  ENDIF
        :  :  UNTIL timer expired AND done clear
        :  ENDREPEAT
#       :  IF expected byte count NEQ actual byte count
#       :  :  THEN
#       :  :  :  Report error
        :  :  :  Exit test
#       :  ENDIF
        :  Examine data for first directory on tape
        :  IF directory NEQ scrat.ch
        :  :  THEN
        :  :  WHILE write directory flag EQL zero DO
```

```
                :  :  :  Prompt operator to overwrite directory
                :  :  :  IF response EQL no
                :  :  :  :  THEN
                :  :  :  :  Exit test
                :  :  :  ENDIF
                :  :  :  IF response EQL yes
                :  :  :  :  THEN
                :  :  :  :  Set write directory flag
                :  :  :  :  Point to write directory command packet
                :  :  :  :  REPEAT
                :  :  :  :  :  Send command packet byte at a time
                :  :  :  :  :  Set timer
                :  :  :  :  :  IF timer expired AND no response
                :  :  :  :  :  :  THEN
                :  :  :  :  :  :  Report no response error
                :  :  :  :  :  :  Exit test
                :  :  :  :  :  ENDIF
                :  :  :  :  :  UNTIL all bytes sent
                :  :  :  :  ENDREPEAT
                :  :  :  :  Wait for continue
                :  :  :  :  Set timer
                :  :  :  :  IF timer expired AND no response
                :  :  :  :  :  THEN
                :  :  :  :  :  Report no response error
                :  :  :  :  :  Exit test
                :  :  :  :  ENDIF
                :  :  :  :  Point to data packet with "scrat.ch" directory
                :  :  :  :  REPEAT
                :  :  :  :  :  Send data packet byte at a time
                :  :  :  :  :  Set timer
                :  :  :  :  :  IF timer expired AND no response
                :  :  :  :  :  :  THEN
                :  :  :  :  :  :  Report no response error
                :  :  :  :  :  :  Exit test
                :  :  :  :  :  ENDIF
                :  :  :  :  :  UNTIL all bytes sent
                :  :  :  :  ENDREPEAT
                :  :  :  :  REPEAT
                :  :  :  :  :  Read end packet into buffer byte at a time
                :  :  :  :  :  Set timer
                :  :  :  :  :  IF timer expired AND no response
                :  :  :  :  :  :  THEN
                :  :  :  :  :  :  Report no response error
                :  :  :  :  :  :  Exit test
                :  :  :  :  :  ENDIF
                :  :  :  :  :  :  UNTIL all bytes read
                :  :  :  :  ENDREPEAT
                :  :  :  :  Point to expected and received end packets
                :  :  :  :  REPEAT
                :  :  :  :  :  IF expected data NEQ received data
                :  :  :  :  :  :  THEN
                :  :  :  :  :  :  Report data error
                :  :  :  :  :  :  Exit subtest
                :  :  :  :  :  ENDIF
                :  :  :  :  :  UNTIL all bytes checked
                :  :  :  :  ENDREPEAT
```

```
        : : : ENDIF
        : : ENDWHILE
        : ENDIF
        ENDSUBTEST READ DIRECTORY
```

3.7.2.2 WRITE BLOCK

This subtest sends the TU58 a command packet to write one block with 512 bytes of data. A continue flag should be returned between sending each data packet and an end packet is then returned from the TU58. Four 128-byte data packets are sent to fill one block. All byte transactions between the host and TU58 are timed. If any timer times out while expecting a data transfer to occur an error is reported. The data packets contain alternating bytes of all ones and all zeroes. The end packet is checked and if any errors have occured, they are reported.

Subtest steps:

```
        SUBTEST WRITE BLOCK
        : Clear buffer
        : Point to write command packet
        : REPEAT
        : : Send command packet byte at a time
        : : Set timer
        : : IF timer expired AND no response
        : : : THEN
        : : : Report no response error
        : : : Exit test
        : : ENDIF
        : : UNTIL all bytes sent
        : ENDREPEAT
        : DO for count = 1 to 4
        : : Wait for continue
        : : Set timer
        : : IF timer expired AND no response
        : : : THEN
        : : : Report no response error
        : : : Exit test
        : : ENDIF
        : : Point to data packet
        : : REPEAT
        : : : Send data packet byte at a time
        : : : Set timer
        : : : IF timer expired AND no response
        : : : : THEN
        : : : : Report no response error
        : : : : Exit test
        : : : ENDIF
        : : : UNTIL all bytes sent
        : : ENDREPEAT
```

```
             :  ENDDO
             :  REPEAT
             :  :  Set timer
             :  :  IF timer expired AND done set
             :  :  :  THEN
             :  :  :  :  Read byte
             :  :  ENDIF
             :  :  UNTIL timer expired AND done clear
             :  ENDREPEAT
#            :  IF expected byte count NEQ actual byte count
#            :  :  THEN
#            :  :  :  Report error
             :  :  :  Exit test
#            :  ENDIF
             :  REPEAT
             :  :  Point to expected end packet
             :  :  IF expected end packet data NEQ received end packet data
             :  :  :  THEN
             :  :  :  Report end packet data error
             :  :  ENDIF
             :  :  UNTIL all data checked
             :  ENDREPEAT
             ENDSUBTEST WRITE BLOCK
```

3.7.2.3 READ BLOCK

This subtest sends the TU58 a command packet to read the 512 bytes of data that were written in the previous subtest. A timer is set which will time out if there is no response from the TU58 between each byte transaction. The end packet and data packets are checked for errors. If any errors are encountered they are reported.

Subtest steps:

```
SUBTEST READ BLOCK
:  Clear buffer
:  Point to read command packet
:  REPEAT
:  :  Send command packet byte at a time
:  :  Set timer
:  :  IF timer expired and no response
:  :  :  THEN
:  :  :  Report no response error
:  :  :  Exit test
:  :  ENDIF
:  :  UNTIL all bytes sent
:  ENDREPEAT
:  REPEAT
:  :  Set timer
:  :  IF timer expired AND done set
:  :  :  THEN
```

```
          : : : : Read byte
          : : ENDIF
          : : UNTIL timer expired AND done clear
          : ENDREPEAT
     #    : IF expected byte count NEQ actual byte count
     #    : : THEN
     #    : : : Report error
          : : : Exit test
     #    : ENDIF
          : REPEAT
          : : Point to expected data packet
          : : REPEAT
          : : : IF data expected NEQ data received
          : : : : THEN
          : : : : Report data error
          : : : : Exit subtest
          : : : ENDIF
          : : : Point to next byte of data
          : : : UNTIL all data in packet checked
          : : ENDREPEAT
          : : UNTIL 4 data packets checked
          : ENDREPEAT
          : Point to expected end packet
          : REPEAT
          : : IF data expected NEQ data received
          : : : THEN
          : : : Report data error
          : : : Exit subtest
          : : ENDIF
          : : UNTIL all end packet bytes checked
          : ENDREPEAT
          ENDSUBTEST READ BLOCK
```

3.7.2.4 WRITE MODIFIED

This subtest sends the TU58 a command packet to write modified 512 bytes of data. A timer is set which will time out if a response is not received within the allotted time on all byte transactions between the host and TU58. Four 128 byte data packets are sent. Before each data packet is sent a continue is read from the TU58 and when all data has been sent the end packet is read from the TU58 and checked. If any errors are encountered they are reported. This modified command will write all of the data and then back up and check the checksum for data just written.

Subtest steps:

```
          SUBTEST WRITE MODIFIED
          : Clear buffer
          : Point to write command packet
          : REPEAT
```

```
     : : Send command packet byte at a time
     : : Set timer
     : : IF timer expired AND no response
     : : : THEN
     : : : Report no response error
     : : : Exit test
     : : ENDIF
     : : UNTIL all bytes sent
     : ENDREPEAT
     : DO for count = 1 to 4
     : : Wait for continue
     : : Set timer
     : : IF timer expired AND no continue
     : : : THEN
     : : : Report no continue error
     : : : Exit test
     : : ENDIF
     : : Point to data packet
     : : REPEAT
     : : : Send data packet byte at a time
     : : : Set timer
     : : : IF timer expired AND no response
     : : : : THEN
     : : : : Report no response error
     : : : : Exit test
     : : : ENDIF
     : : : UNTIL all bytes sent
     : : ENDREPEAT
     : ENDDO
     : REPEAT
     : : Set timer
     : : IF timer expired AND done set
     : : : THEN
     : : : : Read byte
     : : ENDIF
     : : UNTIL timer expired AND done clear
     : ENDREPEAT
#    : IF expected byte count NEQ actual byte count
#    : : THEN
#    : : : Report error
     : : : Exit test
#    : ENDIF
     : Point to expected end packet
     : REPEAT
     : : IF expected end packet data NEQ received end packet data
     : : : THEN
     : : : Report end packet data error
     : : ENDIF
     : : UNTIL all data checked
     : ENDREPEAT
     ENDSUBTEST WRITE MODIFIED
```

3.7.2.5 READ MODIFIED

This subtest sends the TU58 a command packet to read modified the 512 bytes of data written in the previous subtest. This command will cause the TU58 to read the tape with an increased threshold. A timer is set which will time out if there is no response within the allotted time. After reading the first byte of data, another timer is set which will time out if an end packet is not received within the allotted time. If any data or timer errors are encountered, they are reported.

Subtest steps:

```
      SUBTEST READ MODIFIED
      : Clear buffer
      : Point to read command packet
      : REPEAT
      : : Send command packet byte at a time
      : : Set timer
      : : IF timer expired and no response
      : : : THEN
      : : : Report no response error
      : : : Exit test
      : : ENDIF
      : : UNTIL all bytes sent
      : ENDREPEAT
      : REPEAT
      : : Set timer
      : : IF timer expired AND done set
      : : : THEN
      : : : : Read byte
      : : ENDIF
      : : UNTIL timer expired AND done clear
      : ENDREPEAT
#     : IF expected byte count NEQ actual byte count
#     : : THEN
#     : : : Report error
      : : : Exit test
#     : ENDIF
      : REPEAT
      : : Point to expected data packet
      : : REPEAT
      : : : IF data expected NEQ data received
      : : : : THEN
      : : : : Report data error
      : : : : Exit subtest
      : : : ENDIF
      : : : Point to next byte of data
      : : : UNTIL all data in packet checked
      : : ENDREPEAT
      : : UNTIL 4 data packets checked
      : ENDREPEAT
      : Point to expected end packet
      : REPEAT
      : : IF end packet data expected NEQ end packet data received
```

```
        :  :  :  THEN
        :  :  :  Report end packet data error
        :  :  :  Exit subtest
        :  :  ENDIF
        :  :  UNTIL all end packet bytes checked
        :  ENDREPEAT
        ENDSUBTEST READ MODIFIED
```

3.7.2.6 WRITE RECORD

This subtest sends the TU58 a command packet to write one record with 128 bytes of data. A continue flag is returned and the data packet is sent. All byte transactions between the host and TU58 are timed and will timeout if there is no response within the allotted time. If a timer expires while expecting a data transfer to occur, an error is reported. The data packet contains alternating bytes of all one's and all zero's. Both end and data packets are checked and if any errors have occured, they are reported.

Subtest steps:

```
        SUBTEST WRITE RECORD
        :  Clear buffer
        :  Point to write command packet
        :  REPEAT
        :  :  Send command packet byte at a time
        :  :  Set timer
        :  :  IF timer expired AND no response
        :  :  :  THEN
        :  :  :  Report no response error
        :  :  :  Exit test
        :  :  ENDIF
        :  :  UNTIL all bytes sent
        :  ENDREPEAT
        :  Wait for continue
        :  Set timer
        :  IF timer expired AND no continue
        :  :  THEN
        :  :  Report no continue error
        :  :  Exit test
        :  ENDIF
        :  Point to data packet
        :  REPEAT
        :  :  Send data packet byte at a time
        :  :  Set timer
        :  :  IF timer expired AND no response
        :  :  :  THEN
        :  :  :  Report no response error
        :  :  :  Exit test
        :  :  ENDIF
        :  :  UNTIL all bytes sent
        :  ENDREPEAT
        :  REPEAT
        :  :  Set timer
        :  :  IF timer expired AND done set
        :  :  :  THEN
        :  :  :  :  Read byte
        :  :  ENDIF
        :  :  UNTIL timer expired AND done clear
        :  ENDREPEAT
#       :  IF expected byte count NEQ actual byte count
#       :  :  THEN
#       :  :  :  Report error
        :  :  :  Exit test
#       :  ENDIF
        :  REPEAT
        :  :  Point to expected end packet
        :  :  IF expected end packet data NEQ received end packet data
        :  :  :  THEN
        :  :  :  Report end packet data error
        :  :  ENDIF
        :  :  UNTIL all data checked
        :  ENDREPEAT
        ENDSUBTEST WRITE RECORD
```

3.7.2.7 READ RECORD

This subtest sends the TU58 a command packet to read the 128 bytes of data that were written in the previous subtest. A timer is set and times out if there is no response between all byte transactions. The end packet and data packet are checked for errors. If any errors are encountered they are reported.

Subtest steps:

```
        SUBTEST READ RECORD
        :  Clear buffer
        :  Point to read command packet
        :  REPEAT
        :  :  Send command packet byte at a time
        :  :  Set timer
        :  :  IF timer expired and no response
        :  :  :  THEN
        :  :  :  Report no response error
        :  :  :  Exit test
        :  :  ENDIF
        :  :  UNTIL all bytes sent
        :  ENDREPEAT
        :  REPEAT
        :  :  Set timer
        :  :  IF timer expired AND done set
        :  :  :  THEN
```

```
     :  :  :  :  Read byte
     :  :  ENDIF
     :  :  UNTIL timer expired AND done clear
     :  ENDREPEAT
#    :  IF expected byte count NEQ actual byte count
#    :  :  THEN
#    :  :  :  Report error
     :  :  :  Exit test
#    :  ENDIF
     :  Point to expected data packet
     :  REPEAT
     :  :  IF data expected NEQ data received
     :  :  :  THEN
     :  :  :  Report data error
     :  :  :  Exit subtest
     :  :  ENDIF
     :  :  Point to next byte of data
     :  :  UNTIL all data in packet checked
     :  ENDREPEAT
     :  Point to expected end packet
     :  REPEAT
     :  :  IF expected end packet data NEQ received end packet data
     :  :  :  THEN
     :  :  :  Report end packet data error
     :  :  :  Exit subtest
     :  :  ENDIF
     :  :  UNTIL all end packet bytes checked
     :  ENDREPEAT
     ENDSUBTEST READ RECORD
```

3.7.2.8 WRITE BLOCK - PADDED ZEROS

This subtest sends the TU58 a series of command packets to check that a block written with less than 512 bytes of data, will pad the remainder of the block with data bytes of zeros. This is accomplished by writing two consecutive blocks each with 512 bytes of all ones. Then a command packet is sent to write the first block with one byte of alternating ones and zeroes. This command should write the first byte with 10101010 and the remaining 511 bytes with 00000000. The second block should still contain 512 bytes of all one's data. This data is read and checked. All end packets and data packets are checked as the subtest progresses. All byte transactions between host and TU58 are timed. If any errors are encountered, they are reported.

Subtest steps:

```
SUBTEST WRITE BLOCK PADDED ZEROS
:  Clear buffer
:  Point to first write command packet
:  DO for count = 1 to 3
```

```
        :  :  REPEAT
        :  :  :  Send command packet byte at a time
        :  :  :  Set timer
        :  :  :  IF timer expired AND no response
        :  :  :  :  THEN
        :  :  :  :  Report no response error
        :  :  :  :  Exit test
        :  :  :  ENDIF
        :  :  :  UNTIL all bytes sent
        :  :  ENDREPEAT
        :  :  DO for count = 1 to 4
        :  :  :  Wait for continue
        :  :  :  Set timer
        :  :  :  IF timer expired AND no continue
        :  :  :  :  THEN
        :  :  :  :  Report no continue error
        :  :  :  :  Exit test
        :  :  :  ENDIF
        :  :  :  Point to data packet
        :  :  :  REPEAT
        :  :  :  :  Send data packet byte at a time
        :  :  :  :  Set timer
        :  :  :  :  IF timer expired AND no response
        :  :  :  :  :  THEN
        :  :  :  :  :  Report no response error
        :  :  :  :  :  Exit test
        :  :  :  :  ENDIF
        :  :  :  :  UNTIL all bytes sent
        :  :  :  ENDREPEAT
        :  :  ENDDO
        :  :  REPEAT
        :  :  :  Set timer
        :  :  :  IF timer expired AND done set
        :  :  :  :  THEN
        :  :  :  :  :  Read byte
        :  :  :  ENDIF
        :  :  :  UNTIL timer expired AND done clear
        :  :  ENDREPEAT
#       :  :  IF expected byte count NEQ actual byte count
#       :  :  :  THEN
#       :  :  :  :  Report error
        :  :  :  :  Exit test
#       :  :  ENDIF
        :  :  REPEAT
        :  :  :  Point to expected end packet
        :  :  :  IF expected end data NEQ received end data
        :  :  :  :  THEN
        :  :  :  :  Report end packet data error
        :  :  :  ENDIF
        :  :  :  UNTIL all data checked
        :  :  ENDREPEAT
        :  :  Point to next write command
        :  ENDDO
        :  Clear buffer
        :  Point to first read command packet
        :  DO for count = 1 to 2
```

```
          : : REPEAT
          : : : Send command packet byte at a time
          : : : Set timer
          : : : IF timer expired and no response
          : : : : THEN
          : : : : Report no response error
          : : : : Exit test
          : : : ENDIF
          : : : UNTIL all bytes sent
          : : ENDREPEAT
          : : : REPEAT
          : : : Set timer
          : : : IF timer expired AND done set
          : : : : THEN
          : : : : : Read byte
          : : : ENDIF
          : : : UNTIL timer expired AND done clear
          : : ENDREPEAT
    #     : : IF expected byte count NEQ actual byte count
    #     : : : THEN
    #     : : : : Report error
          : : : : Exit test
    #     : : ENDIF
          : : REPEAT
          : : : Point to expected data packet
          : : : REPEAT
          : : : : IF data expected NEQ data received
          : : : : : THEN
          : : : : : Report data error
          : : : : : Exit subtest
          : : : : ENDIF
          : : : : Point to next byte of data
          : : : : UNTIL all data in packet checked
          : : : ENDREPEAT
          : : : UNTIL 4 data packets checked
          : : ENDREPEAT
          : : Point to expected end packet
          : : REPEAT
          : : : IF end data expected NEQ end data received
          : : : : THEN
          : : : : Report end packet data error
          : : : : Exit subtest
          : : : ENDIF
          : : : UNTIL all end packet bytes checked
          : : ENDREPEAT
          : ENDDO ENDSUBTEST WRITE BLOCK PADDED ZEROS
```

3.7.2.9 WRITE RECORD - PADDED ZEROS

This subtest sends the TU58 a series of command packets to check that a record written with less than 128 bytes of data, will pad the remainder of the record with data bytes of zeroes. This is accomplished by writing two consecutive records each with 128 bytes of all ones. Then a command packet is sent to write the first record with one byte of alternating ones and zeroes data. This command should write the first byte with 10101010 and the remaining 127 bytes with 00000000. The second block should still contain 128 bytes of all ones data. This data is read and checked. All end packets and data packets are checked as the subtest progresses. All byte transactions between the host and TU58 are timed. If any errors are encountered, they are reported.

Subtest steps:

```
SUBTEST WRITE RECORD PADDED ZEROS
:  Clear buffer
:  Point to first write command packet
:  DO for count = 1 to 3
:  :  REPEAT
:  :  :  Send command packet byte at a time
:  :  :  Set timer
:  :  :  IF timer expired AND no response
:  :  :  :  THEN
:  :  :  :  Report no response error
:  :  :  :  Exit test
:  :  :  ENDIF
:  :  :  UNTIL all bytes sent
:  :  ENDREPEAT
:  :  Wait for continue
:  :  Set timer
:  :  IF timer expired AND no continue
:  :  :  THEN
:  :  :  Report no continue error
:  :  :  Exit test
:  :  ENDIF
:  :  Point to data packet
:  :  REPEAT
:  :  :  Send data packet byte at a time
:  :  :  Set timer
:  :  :  IF timer expired AND no response
:  :  :  :  THEN
:  :  :  :  Report no response error
:  :  :  :  Exit test
:  :  :  ENDIF
:  :  :  UNTIL all bytes sent
:  :  ENDREPEAT
:  :  REPEAT
:  :  :  Set timer
:  :  :  IF timer expired AND done set
:  :  :  :  THEN
:  :  :  :  :  Read byte
:  :  :  ENDIF
```

```
                :  :  :  UNTIL timer expired AND done clear
                :  :  ENDREPEAT
        #       :  :  IF expected byte count NEQ actual byte count
        #       :  :  :  THEN
        #       :  :  :  :  Report error
                :  :  :  :  Exit test
        #       :  :  ENDIF
                :  :  REPEAT
                :  :  :  Point to expected end packet
                :  :  :  IF expected end data NEQ received end data
                :  :  :  :  THEN
                :  :  :  :  Report end packet data error
                :  :  :  ENDIF
                :  :  :  UNTIL all data checked
                :  :  ENDREPEAT
                :  :  Point to next write command
                :  ENDDO
                :  Clear buffer
                :  Point to first read command packet
                :  DO for count = 1 to 2
                :  :  REPEAT
                :  :  :  Send command packet byte at a time
                :  :  :  Set timer
                :  :  :  IF timer expired and no response
                :  :  :  :  THEN
                :  :  :  :  Report no response error
                :  :  :  :  Exit test
                :  :  :  ENDIF
                :  :  :  UNTIL all bytes sent
                :  :  ENDREPEAT
                :  :  REPEAT
                :  :  :  Set timer
                :  :  :  IF timer expired AND done set
                :  :  :  :  THEN
                :  :  :  :  :  Read byte
                :  :  :  ENDIF
                :  :  :  UNTIL timer expired AND done clear
                :  :  ENDREPEAT
        #       :  :  IF expected byte count NEQ actual byte count
        #       :  :  :  THEN
        #       :  :  :  :  Report error
                :  :  :  :  Exit test
        #       :  :  ENDIF
                :  :  Point to expected data packet
                :  :  REPEAT
                :  :  :  IF data expected NEQ data received
                :  :  :  :  THEN
                :  :  :  :  Report data error
                :  :  :  :  Exit subtest
                :  :  :  ENDIF
                :  :  :  Point to next byte of data
                :  :  :  UNTIL all data in packet checked
                :  :  ENDREPEAT
                :  :  Point to expected end packet
                :  :  REPEAT
                :  :  :  IF end data expected NEQ end data received
```

```
: : : : THEN
: : : : Report end packet data error
: : : : Exit subtest
: : : ENDIF
: : : UNTIL all end packet bytes checked
: : ENDREPEAT
: ENDDO
ENDSUBTEST WRITE RECORD PADDED ZEROS
```

3.7.2.10 BLOCK WRITE - READ

This subtest sends the TU58 controller a series of command packets that will cause head switches, forward seeks, reverse seeks and seeks with head switches during read and write operations on blocks. All data written is read and checked. All end packets are checked as the subtest progresses. If any errors occur they are reported.

Subtest steps:

```
SUBTEST BLOCK WRITE - READ
: DO for count = 1 to 5
: : Point to write command packet
: : Clear buffer
: : REPEAT
: : : Send command packet byte at a time
: : : Set timer
: : : IF timer expired AND no response
: : : : THEN
: : : : Report no response error
: : : : Exit test
: : : ENDIF
: : : UNTIL all bytes sent
: : ENDREPEAT
: : DO for count = 1 to 4
: : : Wait for continue
: : : Set timer
: : : IF timer expired AND no continue
: : : : THEN
: : : : Report no continue error
: : : : Exit test
: : : ENDIF
: : : Point to data packet
: : : REPEAT
: : : : Send data packet byte at a time
: : : : Set timer
: : : : IF timer expired AND no response
: : : : : THEN
: : : : : Report no response error
: : : : : Exit test
: : : : ENDIF
: : : : UNTIL all bytes sent
: : : ENDREPEAT
```

```
        :  :  ENDDO
        :  :  REPEAT
        :  :  :  Set timer
        :  :  :  IF timer expired AND done set
        :  :  :  :  THEN
        :  :  :  :  :  Read byte
        :  :  :  ENDIF
        :  :  :  UNTIL timer expired AND done clear
        :  :  ENDREPEAT
#       :  :  IF expected byte count NEQ actual byte count
#       :  :  :  THEN
#       :  :  :  :  Report error
        :  :  :  :  Exit test
#       :  :  ENDIF
        :  :  REPEAT
        :  :  :  Point to expected end packet
        :  :  :  IF expected end data NEQ received end data
        :  :  :  :  THEN
        :  :  :  :  Report end packet data error
        :  :  :  ENDIF
        :  :  :  UNTIL all data checked
        :  :  ENDREPEAT
        :  :  Point to read command packet
        :  :  REPEAT
        :  :  :  Send command packet byte at a time
        :  :  :  Set timer
        :  :  :  IF timer expired and no response
        :  :  :  :  THEN
        :  :  :  :  Report no response error
        :  :  :  :  Exit test
        :  :  :  ENDIF
        :  :  :  UNTIL all bytes sent
        :  :  ENDREPEAT
        :  :  REPEAT
        :  :  :  Set timer
        :  :  :  IF timer expired AND done set
        :  :  :  :  THEN
        :  :  :  :  :  Read byte
        :  :  :  ENDIF
        :  :  :  UNTIL timer expired AND done clear
        :  :  ENDREPEAT
#       :  :  IF expected byte count NEQ actual byte count
#       :  :  :  THEN
#       :  :  :  :  Report error
        :  :  :  :  Exit test
#       :  :  ENDIF
        :  :  REPEAT
        :  :  :  Point to expected data packet
        :  :  :  REPEAT
        :  :  :  :  IF data expected NEQ data received
        :  :  :  :  :  THEN
        :  :  :  :  :  Report data error
        :  :  :  :  :  Exit subtest
        :  :  :  :  ENDIF
        :  :  :  :  Point to next byte of data
        :  :  :  :  UNTIL all data in packet checked
:  :  :  ENDREPEAT
:  :  :  UNTIL 4 data packets checked
:  :  ENDREPEAT
:  :  Point to expected end packet
:  :  REPEAT
:  :  :  IF data expected NEQ data received
:  :  :  :  THEN
:  :  :  :  Report data error
:  :  :  :  Exit subtest
:  :  :  ENDIF
:  :  :  UNTIL all end packet bytes checked
:  :  ENDREPEAT
:  ENDDO
ENDSUBTEST BLOCK WRITE - READ
```

3.7.2.11 RECORD WRITE - READ

This subtest sends the TU58 controller a series of command packets that will cause head switches, forward seeks, reverse seeks and seeks with head switches during read and write operations on records. All data written is read and checked. All end packets are checked as the subtest progresses. If any errors occur they are reported.

Subtest steps:

```
SUBTEST RECORD WRITE - READ
:  DO for count = 1 to 5
:  :  Point to write command packet
:  :  Clear buffer
:  :  REPEAT
:  :  :  Send command packet byte at a time
:  :  :  Set timer
:  :  :  IF timer expired AND no response
:  :  :  :  THEN
:  :  :  :  Report no response error
:  :  :  :  Exit test
:  :  :  ENDIF
:  :  :  UNTIL all bytes sent
:  :  ENDREPEAT
:  :  DO for count = 1 to 2
:  :  :  Wait for continue
:  :  :  Set timer
:  :  :  IF timer expired AND no continue
:  :  :  :  THEN
:  :  :  :  Report no continue error
:  :  :  :  Exit test
:  :  :  ENDIF
:  :  :  Point to data packet
:  :  :  REPEAT
:  :  :  :  Send data packet byte at a time
:  :  :  :  Set timer
```

```
        :  :  :  :  IF timer expired AND no response
        :  :  :  :  :  THEN
        :  :  :  :  :  Report no response error
        :  :  :  :  :  Exit test
        :  :  :  :  ENDIF
        :  :  :  :  UNTIL all bytes sent
        :  :  :  ENDREPEAT
        :  :  ENDDO
        :  :  REPEAT
        :  :  :  Set timer
        :  :  :  IF timer expired AND done set
        :  :  :  :  THEN
        :  :  :  :  :  Read byte
        :  :  :  ENDIF
        :  :  :  UNTIL timer expired AND done clear
        :  :  ENDREPEAT
#       :  :  IF expected byte count NEQ actual byte count
#       :  :  :  THEN
#       :  :  :  :  Report error
        :  :  :  :  Exit test
#       :  :  ENDIF
        :  :  REPEAT
        :  :  :  Point to expected end packet
        :  :  :  IF expected end data NEQ received end data
        :  :  :  :  THEN
        :  :  :  :  Report end packet data error
        :  :  :  ENDIF
        :  :  :  UNTIL all data checked
        :  :  ENDREPEAT
        :  :  Point to read command packet
        :  :  REPEAT
        :  :  :  Send command packet byte at a time
        :  :  :  Set timer
        :  :  :  IF timer expired and no response
        :  :  :  :  THEN
        :  :  :  :  Report no response error
        :  :  :  :  Exit test
        :  :  :  ENDIF
        :  :  :  UNTIL all bytes sent
        :  :  ENDREPEAT
        :  :  REPEAT
        :  :  :  Set timer
        :  :  :  IF timer expired AND done set
        :  :  :  :  THEN
        :  :  :  :  :  Read byte
        :  :  :  ENDIF
        :  :  :  UNTIL timer expired AND done clear
        :  :  ENDREPEAT
#       :  :  IF expected byte count NEQ actual byte count
#       :  :  :  THEN
#       :  :  :  :  Report error
        :  :  :  :  Exit test
#       :  :  ENDIF
        :  :  REPEAT
        :  :  :  Point to expected data packet
        :  :  :  REPEAT
: : : : IF data expected NEQ data received
: : : : : THEN
: : : : : Report data error
: : : : : Exit subtest
: : : : ENDIF
: : : : Point to next byte of data
: : : : UNTIL all data in packet checked
: : : ENDREPEAT
: : : UNTIL 4 data packets checked
: : ENDREPEAT
: : Point to expected end packet
: : REPEAT
: : : IF data expected NEQ data received
: : : : THEN
: : : : Report data error
: : : : Exit subtest
: : : ENDIF
: : : UNTIL all end packet bytes checked
: : ENDREPEAT
: ENDDO
ENDSUBTEST RECORD WRITE - READ
```

3.7.2.12 WRITE RECORD INTERRUPT

This subtest sends the TU58 a command packet to write one record of 128 bytes in interrupt mode. When an interrupt occurs the write service routine sends the next byte. A timeout occurs after sufficient time has passed to send a full packet, at which time an end packet is read and checked. An error is reported if an interrupt fails to occur before the timer expires and the full packet has not been sent. The data packet sent contains alternating bytes of all one's and all zero's. The data will be read and checked for errors in the next subtest.

Subtest steps:

```
SUBTEST WRITE RECORD INTERRUPT
: Clear buffer
: Point to write command packet
: REPEAT
: : Send command packet byte at a time
: : Set timer
: : IF timer expired AND no response
: : : THEN
: : : Report no response error
: : : Exit test
: : ENDIF
: : UNTIL all bytes sent
: ENDREPEAT
: Wait for continue
: Set timer
: IF timer expired AND no continue
```

```
            :  :  THEN
            :  :  Report no continue error
            :  :  Exit test
            :  ENDIF
            :  Point to data packet
            :  Enable send interrupt
            :  REPEAT
            :  :  Send data packet byte at a time
            :  :  Set timer
            :  :  IF timer expired AND no response
            :  :  :  THEN
            :  :  :  :  DISABLE send interrupt
            :  :  :  :  Report no response error
            :  :  :  :  Exit test
            :  :  ENDIF
            :  :  UNTIL all bytes sent
            :  ENDREPEAT
            :  DISABLE send interrupt
            :  REPEAT
            :  :  Set timer
            :  :  IF timer expired AND done set
            :  :  :  THEN
            :  :  :  :  Read byte
            :  :  ENDIF
            :  :  UNTIL timer expired AND done clear
            :  ENDREPEAT
    #       :  IF expected byte count NEQ actual byte count
    #       :  :  THEN
    #       :  :  :  Report error
            :  :  :  Exit test
    #       :  ENDIF
            :  REPEAT
            :  :  Point to expected end packet
            :  :  IF expected end packet data NEQ received end packet data
            :  :  :  THEN
            :  :  :  Report end packet data error
            :  :  ENDIF
            :  :  UNTIL all data checked
            :  ENDREPEAT
            ENDSUBTEST WRITE RECORD INTERRUPT
```

3.7.2.13 READ RECORD INTERRUPT

This subtest sends the TU58 a command packet to read the last 128 bytes of data that were written in the previous subtest in the interrupt driven mode. A timer is set which should allow sufficient time to read a complete record and end packet. An error is reported if this does not occur within the allotted time. The end packet and data packet are checked for errors. If any errors are encountered they are reported.

Subtest steps:

```
        SUBTEST READ RECORD INTERRUPT
        :  Clear buffer
        :  Point to read command packet
        :  REPEAT
        :  :  Send command packet byte at a time
        :  :  Set timer
        :  :  IF timer expired and no response
        :  :  :  THEN
        :  :  :  Report no response error
        :  :  :  Exit test
        :  :  ENDIF
        :  :  UNTIL all bytes sent
        :  ENDREPEAT
        :  ENABLE read interrupt
        :  SET timer
        :  REPEAT
        :  :  IF interrupt occurs
        :  :  :  THEN
        :  :  :  :  Read byte
        :  :  ENDIF
        :  :  UNTIL timer expired
        :  ENDREPEAT
#       :  IF expected byte count NEQ actual byte count
#       :  :  THEN
        :  :  :  DISABLE read interrupt
#       :  :  :  Report error
        :  :  :  Exit test
#       :  ENDIF
        :  DISABLE read interrupt
        :  Point to expected data packet
        :  REPEAT
        :  :  IF data expected NEQ data received
        :  :  :  THEN
        :  :  :  Report data error
        :  :  :  Exit subtest
        :  :  ENDIF
        :  :  Point to next byte of data
        :  :  UNTIL all data in packet checked
        :  ENDREPEAT
        :  Point to expected end packet
        :  REPEAT
        :  :  IF expected end packet data NEQ received end packet data
        :  :  :  THEN
        :  :  :  Report end packet data error
        :  :  :  Exit subtest
        :  :  ENDIF
        :  :  UNTIL all end packet bytes checked
        :  ENDREPEAT
        ENDSUBTEST READ RECORD INTERRUPT
```

3.7.2.14 IPL CHECK

This subtest checks that the TU58 interrupt occurs at the correct interrupt priority level. The IPL is set one level above that at which a TU58 interrupt should occur. A NOP command is issued to cause the return of an end packet in interrupt mode. If an interrupt occurs an error is reported. The IPL is then decremented and if an interrupt does not occur within a reasonable interval an error is reported. There are no data checks made.

Subtest steps:

```
SUBTEST IPL CHECK
:  Point to NOP command packet
:  DISABLE TU58 Read Interrupt
:  RAISE IPL to prohibit TU58 Read Interrupt
:  REPEAT
:  :  SEND command packet byte at a time
:  :  SET timer
:  :  IF timer expired AND no response
:  :  :  THEN
:  :  :  :  REPORT no response error
:  :  :  :  Exit test
:  :  ENDIF
:  :  UNTIL all bytes sent
:  ENDREPEAT
:  SET timer
:  ENABLE read interrupt
:  IF interrupt occurs before timeout
:  :  THEN
:  :  :  DISABLE read interrupt
:  :  :  REPORT error
:  :  ENDIF
:  DISABLE read interrupt
:  DECR IPL to allow TU58 Read Interrupt
:  SET timer
:  ENABLE read interrupt
:  IF timer expires AND no interrupt
:  :  THEN
:  :  :  DISABLE read interrupt
:  :  :  REPORT error
:  ENDIF
:  DISABLE read interrupt
:  CLEAR IPL
ENDSUBTEST IPL CHECK
```

3.8 ENKAXH: UNIBUS INTERFACE TEST

This module consists of two tests that check the VAX-11/730 Unibus interface (UBI). This includes testing of the interface CSR, MAP's, and different types of data transactions and exercising UBE's. This program runs under the Diagnostic Supervisor and is intended for use on a VAX 11/730 system.

3.8.1 UNIBUS Functional Test

This test will be implemented to run using a Unibus Exerciser (UBE). This test checks the UBI CSR, MAP's and various data transactions using a Unibus Exerciser. The UBE must be set up at address 770000 (Oc- tal) with vector 510 (Octal).

3.8.1.1 CSR

This subtest checks that the UBI CSR register is accessible and that writing a one to the status bits results in the bits remaining cleared. In error reporting the UNUSED bits will be masked out since they are unpredictable. The bits are defined as follows:

```
          CSR
##########31 30 17 16 15 14 13 0
          +-----+--------+-----+------------+--------+--------+
          | RDS | Unused | NXM | Map Parity | Wr Err | Unused |
          +-----+--------+-----+------------+--------+--------+
```

Subtest steps:

```
        SUBTEST CSR
        :  Attempt access to CSR
        :  IF unsuccessful
        :  :  THEN REPORT access error
        :  ENDIF
        :  CLEAR Status bits (with read)
        :  IF Status bits not clear
        :  :  THEN REPORT error
        :  ENDIF
        :  WRITE ones to CSR Status Bits
        :  READ CSR
        :  IF Status bits not clear
        :  :  THEN REPORT error
        :  ENDIF
        ENDSUBTEST CSR
```

Errors:

3.8.1.2 Map Data Bus

This subtest checks the integrity of the map data bus by floating a one through a field of zeros and a zero through a field of ones. If all bits can toggle from a one to a zero then the data bus is considered to be good. Only writable bits (31,25,<14:0>) are tested. The remain- ing bits are ignored. In error reporting the unused bits will be masked out since they are unpredictable.

Subtest steps:

```
SUBTEST Map Data Bus
:  REPEAT
:  :  WRITE data pattern to first Map Entry
:  :  READ pattern back
:  :  IF error
:  :  :  THEN REPORT error
:  :  Update pattern
:  :  UNTIL all patterns written
:  ENDREPEAT
ENDSUBTEST Map Data Bus
```

Errors:

3.8.1.3 Map Address Bus

This subtest checks that there are no map address bits stuck or shorted. A unique pattern is written into each map entry at maps num- bered 0, 1, 2, 4, 8, 16, 32, 64, and 128, (so that each address bit assumes both a zero and a one). Reading each of these map entries after all patterns are written will reveal any stuck or short- ed address bus bits because the last pattern written to a doubly ad- dressed map will overwrite the earlier pattern written. Unfortunately a data bit fault in one of the RAMs in a particular map entry may point erroneously to an address bus bit fault. Therefore, to make this test insensitive to a limited number of RAM data bit failures, it is necessary to encode each value prior to storing. The Reed-Muller (16,4) error-correcting code is used. In error reporting the unused bits are masked out since they are unpredictable.

EXPLANATION OF REED-MULLER ERROR-CORRECTING CODE

The basis of the Reed-Muller (16,4) coding space comprises the vectors:

I	1111111111111111
V1	0101010101010101
V2	0011001100110011
V3	0000111100001111

A word is encoded using the following expression:

CODEWORD = G0*I XOR G1*V1 XOR G2*V2 XOR G3*V3

where G0 is the least significant bit and G3 the most significant bit.

Each codeword has 8 disjoint redundant relations due to the nature of the encoding vectors. In V1 the redundant relations are the bit pairs (31,30), (29,28), (27,26), etc. In V2, they are the bit pairs (31,29), (30,28), (27,25), etc. In V3, the relations are (31,27), (30,26), (29,25), etc. Thus, there are three sets of redundant relations in each codeword, and therefore, each bit is represented by 8 disjoint relations. To decode a particular bit, the value of each of the 8 redundant rela- tions is calculated. The position of the bit in the decoded word de- termines which bit pairs will be used. The original word is represent- as:

```
+--+--+--+--+
|G3|G2|G1|G0|
+--+--+--+--+
```

The bits G0 - G3 are referred to as information bits. The LSB has no inherent redundant relations, since it is represented by the product of itself and the identity vector. Here it is convenient to introduce the notion of pair separation. The pair separation for the redundant relations representing G1 is 1; for G2, 2, and for G3, 4.

After decoding the value of each redundant relation for a particular bit, these values are summed. If there was no corruption of the code- word, this sum will be 0 or 8, corresponding to an original value of 0 or 1. If there was any corruption, a majority decision must be made, i.e., if the sum is 4 or greater, the bit Gn is assumed to have been a 1, otherwise, it is assumed 0.

After decoding the three MSBs, the LSB is decoded by eliminating each of the terms G1*V1, G2*V2, and G3*V3, leaving simply G0*I. If there had been no corruption, this term would be 16 0s or 16 1s, representing 0 or 1 respectively. Otherwise, another majority decision must be made, i.e., if 8 or more bits are set, G0 is a 1, else, it is 0.

Subtest steps:

```
SUBTEST Map Address Bus
:  DO FOR Map Number = {0,1,2,4,8,16,32,64,128,256}
:  :  WRITE pattern to Map location
:  ENDDO
:  DO FOR Map Number = {0,1,2,4,8,16,32,64,128,256}
:  :  READ pattern from Map location
:  ENDDO
:  DECODE Data retrieved
:  IF error
:  :  THEN REPORT error
:  ENDIF
ENDSUBTEST Map Address Bus
```

Errors:

3.8.1.4 Map Entry

This subtest checks that all readable/writeable bits of each map entry are not stuck at zero or one. This is accomplished by writing all zeros to a map entry, then reading it to make certain the bits are not stuck at 1. Then a pattern of all ones is written to the entry and read again to verify that it contains all ones to check that there are no bits stuck at zero. This is repeated for all map entries. Again, in error reporting the unused bits will be masked out since they are unpredictable.

Subtest steps:

```
SUBTEST Map Entry
:  REPEAT
:  :  CLEAR Map Entry writable bits
:  :  IF Map Entry not clear
:  :  :  THEN REPORT error
:  :  ENDIF
:  :  WRITE Mask to Map Entry
:  :  IF Map Entry NEQ Mask
:  :  :  THEN REPORT error
:  :  ENDIF
:  :  CLEAR Map Entry writable bits
:  :  IF Map Entry not clear
:  :  :  THEN REPORT error
:  :  ENDIF
:  :  UNTIL all Map Entries tested
:  ENDREPEAT
ENDSUBTEST Map Entry
```

Errors:

3.8.1.5 CPU Read/Write

This subtest checks the ability of the UBI to handle CPU reads and writes to the unibus. The UBE data and address registers are written and read, checking for stuck at one or zero faults. The following data patterns are used to perform this test:

```
0101010101010101
1010101010101010
0011001100110011
0000111100001111
0000000011111111
```

to check for word writes, and

```
01010101
10101010
00110011
00001111
```

to check for byte writes.

Subtest steps:

```
SUBTEST CPU Read/Write
:  PROBE UBE Data Register
:  IF not present
:  :  THEN REPORT error
:  ENDIF
:  REPEAT
:  :  WRITE word pattern to Address register
:  :  READ Address register
:  :  IF error
:  :  :  THEN REPORT error
:  :  ENDIF
:  :  UNTIL patterns exhausted
:  ENDREPEAT
:  REPEAT
:  :  WRITE word pattern to Data register
:  :  READ Data register
:  :  IF error
:  :  :  THEN DO
:  :  :  :  REPORT error
:  :  :  :  EXIT Test
:  :  :  ENDDO
:  :  ENDIF
:  :  UNTIL patterns exhausted
:  ENDREPEAT
:  REPEAT
:  :  WRITE byte pattern to Data register high byte
:  :  WRITE byte pattern to Data register low byte
:  :  READ Data register high byte
:  :  IF error
:  :  :  THEN REPORT error
:  :  ENDIF
:  :  READ Data register low byte
:  :  IF error
:  :  :  THEN REPORT error
:  :  ENDIF
:  :  UNTIL patterns exhausted
:  ENDREPEAT
ENDSUBTEST CPU Read/Write
```

Errors:

3.8.1.6 Interrupts

This subtest checks the ability of the UBI to handle interrupts at BR4- BR7, using the UBE to initiate interrupts at each BR level. The service routine is set up to set flags if the interrupt occurs or if error conditions (at wrong IPL, wrong vector) exist. Any errors are reported.

Subtest steps:

```
SUBTEST INTERRUPTS
```

```
        :  Set IPL at BR7 (17(X))  :   Set  up  UBE  to  interrupt  upon
    becoming bus master at all 4 levels
        :  DO FOR BR level = {4,5,6,7}
        :  :  Set IPL to prohibit BR interrupt
        :  :  IF interrupt occurs
        :  :  :  THEN REPORT error
        :  :  ENDIF
        :  :  Decrement IPL
        :  :  If interrupt does not occur  OR  at  wrong  IPL  OR  wrong
    vector
        :  :  :  THEN REPORT error
        :  :  ENDIF
        :  ENDDO
        ENDSUBTEST INTERRUPTS
```

Errors:

3.8.1.7 DATI 1

This subtest checks the ability to execute a Unibus read (DATI) transaction. The UBE Data register is cleared with a CPU write and a unique data pattern is written to a main memory location. All usable Map Registers are validated and set up to access the main memory location. A DATI is executed and after a nominal wait, the UBE Data register is read. Transfers are made from longword- and word-aligned locations.

Subtest steps:

```
        SUBTEST DATI 1
        :  Size UNIBUS
        :  IF no usable map entries
        :  :  THEN DO
        :  :  :  PRINT exit warning
        :  :  :  EXIT test
        :  :  ENDDO
        :  ENDIF
        :  Validate and point all usable  Map  Entries  to  main  memory
    address
        :  DO FOR Alignment = {word, longword}
        :  :  Load UBE address registers
        :  :  Execute DATI
        :  :  Wait
        :  :  IF Error
        :  :  :  THEN REPORT Error
        :  :  ENDIF
        :  ENDDO
        ENDSUBTEST DATI 1
```

Errors:

3.8.1.8 Map Select

This subtest checks the ability of the UBI to correctly select a map from the page frame of the unibus address. The type of fault that could occur here is a stuck or shorted Unibus address bit, which would cause the wrong map entry to be selected. In order to detect this type of fault, the following steps are executed:

Subtest steps:

```
SUBTEST MAP SELECT
:  Invalidate all Maps
:  DO FOR Map Number = {0,1,2,4,8,16,32,64,128,256}
:  :  IF Map Entry usable
:  :  :  THEN DO
:  :  :  :  VALIDATE Map Entry
:  :  :  :  CLEAR UBE Data register
:  :  :  :  EXECUTE DATI
:  :  :  :  WAIT
:  :  :  :  IF error
:  :  :  :  :  THEN REPORT error
:  :  :  :  ENDIF
:  :  :  :  INVALIDATE Map Entry
:  :  :  ENDDO
:  :  ENDIF
:  ENDDO
ENDSUBTEST MAP SELECT
```

Errors:

3.8.1.9 DATI 2

This subtest checks the ability of the UBI to perform a DATI transaction and the integrity of the data path. The transactions are made from longword and word aligned addresses. The following data patterns are used:

0101010101010101
1010101010101010
0011001100110011
0000111100001111
0000000011111111

Subtest steps:

```
SUBTEST DATI 2
:  Invalidate all maps but one
:  DO for Alignment = {longword,word}
:  :  REPEAT
:  :  :  EXECUTE DATI
:  :  :  WAIT
:  :  :  IF error
:  :  :  :  THEN REPORT error
```

```
        :  :  :  ENDIF
        :  :  :  UNTIL patterns exhausted
        :  :  ENDREPEAT
        :  ENDDO
        ENDSUBTEST DATI 2
```

Errors:

3.8.1.10 DATO

This subtest checks the ability of the UBI to perform a DATO transaction. This test is similar to the DATI 2 subtest, with the data transfer in the opposite direction.

Subtest steps:

```
        SUBTEST DATO
        :  Load UBE address registers
        :  DO FOR Alignment = {word, longword}
        :  :  REPEAT
        :  :  :  EXECUTE DATO
        :  :  :  WAIT
        :  :  :  IF error
        :  :  :  :  THEN REPORT error
        :  :  :  ENDIF
        :  :  :  UNTIL patterns exhausted
        :  :  ENDREPEAT
        :  ENDDO
        ENDSUBTEST DATO
```

Errors:

3.8.1.11 DATOB

This subtest checks the ability of the UBI to perform a DATOB transac- tion. The transactions are made from longword- and word-aligned main memory addresses. The following data patterns are used:

```
                01010101
                10101010
                00110011
                00001111
```

Subtest steps:

```
        SUBTEST DATOB
        :  DO FOR Alignment = {word, longword}
        :  CLEAR Main Memory location
        :  :  REPEAT
        :  :  :  Load pattern into UBE Data Register
        :  :  :  Initiate DATOB
        :  :  :  WAIT
        :  :  :  IF error
        :  :  :  :  THEN REPORT error
        :  :  :  ENDIF
        :  :  :  UNTIL patterns exhausted
        :  :  ENDREPEAT
        :  ENDDO
        ENDSUBTEST DATOB
```

Errors:

3.8.1.12 DATIP/DATO

This subtest checks the ability of the UBI to perform a DATIP/DATO transaction. This test is similar to the DATI 2 subtest, with the addition of checking that the DATO portion of the transaction also works.

Subtest steps:

```
        SUBTEST DATIP/DATO
        :  Invalidate all maps but one
        :  Load UBE address registers
        :  DO FOR Alignment = {word, longword}
        :  :  REPEAT
        :  :  :  EXECUTE DATIP/DATO
        :  :  :  WAIT
        :  :  :  IF error
        :  :  :  :  THEN REPORT error
        :  :  :  ENDIF
        :  :  :  UNTIL patterns exhausted
        :  :  ENDREPEAT
        :  ENDDO
        ENDSUBTEST DATIP/DATO
```

Errors:

3.8.1.13 Address Offset DATI

This subtest checks the ability of the UBI to perform a DATI transaction in address offset mode.

Subtest steps:

```
        SUBTEST Address Offset DATI
        :  Set Byte offset bit in first valid Map Entry
        :  DO for Alignment = {longword,word}
        :  :  REPEAT
        :  :  :  EXECUTE DATI
        :  :  :  WAIT
        :  :  :  IF Execution error
        :  :  :  :  THEN REPORT error
        :  :  :  ENDIF
        :  :  :  IF Data error
        :  :  :  :  THEN REPORT error
        :  :  :  ENDIF
        :  :  :  UNTIL patterns exhausted
        :  :  ENDREPEAT
        :  ENDDO
        ENDSUBTEST Address Offset DATI
```

Errors:

3.8.1.14 Address Offset DATO

This subtest checks the ability of the UBI to perform a DATO transaction in address offset mode.

Subtest steps:

```
        SUBTEST Address Offset DATO
        :  Invalidate all maps but one
        :  DO FOR Alignment = {word, longword}
        :  :  REPEAT
        :  :  :  Initiate DATO
        :  :  :  WAIT
        :  :  :  IF Execution error
        :  :  :  :  THEN REPORT error
        :  :  :  ENDIF
        :  :  :  IF Data error
        :  :  :  :  THEN REPORT error
        :  :  :  ENDIF
        :  :  :  UNTIL patterns exhausted
        :  :  ENDREPEAT
        :  ENDDO
        ENDSUBTEST Address Offset DATO
```

Errors:

3.8.1.15 Address Offset DATOB

This subtest checks the ability of the UBI to perform a DATOB transaction in address offset mode.

Subtest steps:

```
        SUBTEST Address Offset DATOB
        : Invalidate all maps but one
        : DO FOR Alignment = {word, longword}
        : : REPEAT
        : : : Initiate DATOB
        : : : WAIT
        : : : IF Execution error
        : : : : THEN REPORT error
        : : : ENDIF
        : : : IF Data error
        : : : : THEN REPORT error
        : : : ENDIF
        : : : UNTIL patterns exhausted
        : : ENDREPEAT
        : ENDDO
        ENDSUBTEST Address Offset DATOB
```

Errors:

3.8.1.16 Address Offset DATIP/DATO

This subtest checks the ability of the UBI to perform a DATIP/DATO transaction in address offset mode.

Subtest steps:

```
        SUBTEST Address Offset DATIP/DATO
        : Invalidate all maps but one
        : DO FOR Alignment = {word, longword}
        : : REPEAT
        : : : Initiate DATIP/DATO
        : : : WAIT
        : : : IF Execution error
        : : : : THEN REPORT error
        : : : ENDIF
        : : : IF Data error
        : : : : THEN REPORT error
        : : : ENDIF
        : : : UNTIL patterns exhausted
        : : ENDREPEAT
        : ENDDO
        ENDSUBTEST Address Offset DATIP/DATO
```

Errors:

3.8.1.17 Map Function

This subtest checks the ability of the UBI to correctly handle transactions using all useable map registers. 512 map registers are potentially useable, but of that set some may not be useable due to the presence of Unibus Memory. Therefore, before the testing of the maps is started, the Unibus is sized for memory to ascertain which of the maps are useable. A bitvector is generated by the Unibus sizer routine. If a map is useable, its bit in the bitvector is set. For each map that is available for testing, a DATI with a unique pattern is set up, executed and verified.

Subtest steps:

```
SUBTEST MAP FUNCTION
:  Invalidate all Maps
:  REPEAT
:  :  IF Map Entry usable
:  :  :  THEN DO
:  :  :  :  VALIDATE Map Entry
:  :  :  :  CLEAR UBE Data register
:  :  :  :  EXECUTE DATI
:  :  :  :  WAIT
:  :  :  :  IF error
:  :  :  :  :  THEN REPORT error
:  :  :  :  ENDIF
:  :  :  :  INVALIDATE Map Entry
:  :  :  ENDDO
:  :  ENDIF
:  :  UNTIL All Usable Map Entries exhausted
:  ENDREPEAT
ENDSUBTEST MAP FUNCTION
```

Errors:

3.8.1.18 Address Offset Map Function

This subtest checks the ability of the UBI to correctly handle byte-off- set transactions using all useable map registers. 512 map registers are potentially useable, but of that set some may not be useable due to the presence of Unibus Memory. Therefore, before the testing of the maps is started, the Unibus is sized for memory to ascertain which of the maps are useable. A bitvector is generated by the Unibus sizer routine. If a map is useable, its bit in the bitvector is set. For each map that is available for testing, a DATI with a unique pattern is set up, executed and verified.

Subtest steps:

```
SUBTEST ADDRESS OFFSET MAP FUNCTION
:  Invalidate all Maps
:  REPEAT
:  :  IF Map Entry usable
:  :  :  THEN DO
:  :  :  :  VALIDATE Map Entry
:  :  :  :  Set up Map Entry in Byte-offset mode
:  :  :  :  CLEAR UBE Data register
: : : : EXECUTE DATI
: : : : WAIT
: : : : IF error
: : : : : THEN REPORT error
: : : : ENDIF
: : : : INVALIDATE Map Entry
: : : ENDDO
: : ENDIF
: : UNTIL All Usable Map Entries exhausted
: ENDREPEAT
ENDSUBTEST ADDRESS OFFSET MAP FUNCTION
```

Errors:

3.8.1.19 Page Boundary Write Error

This subtest checks that a byte offset write across a page boundary will cause an error if the second page is invalidated.

Subtest steps:

```
SUBTEST Page Boundary Write Error
:  Set up first valid Map Entry to point to valid page
:  Set up DATO to last byte in this page in byte-offset mode
:  Invalidate the page immediately following
:  Initiate DATO
:  IF no error condition generated
:  :  THEN REPORT error
:  ENDIF
:  IF UBI CSR not cleared when read
:  :  THEN REPORT error
:  ENDIF
:  IF unexpected SSYN asserted
:  :  THEN REPORT error
:  ENDIF
ENDSUBTEST Page Boundary Write Error
```

Errors:

3.8.1.20 Map Parity Error

This subtest checks that when the Unibus PB is asserted (simulating a Map Parity Error) and a transfer is attempted, the Map Parity Error bit in the UBI CSR will set and that it will clear when read.

Subtest steps:

```
SUBTEST Map Parity Error
```

```
        : Set FORCE TB PARITY in Memory CSR
        : LOAD Map Entry
        : CLEAR TB Parity bit
        : EXECUTE DATI
        : WAIT
        : IF Map Parity Error bit not set
        : :  THEN REPORT error
        : ENDIF
        : IF Map Parity Error did not clear when read
        : :  THEN REPORT error
        : ENDIF
        : IF unexpected SSYN asserted
        : :  THEN REPORT error
        : ENDIF
        ENDSUBTEST Map Parity Error
```

Errors:

3.8.1.21 NXM Error

This subtest checks that when the UBE attempts to access a non-existent memory location, the NXM Error bit in the UBI CSR will set and that it will clear when read.

Subtest steps:

```
        SUBTEST NXM Error
        : Set up DATI to access NXM address
        : Initiate DATI
        : WAIT
        : IF NXM bit did not set
        : :  THEN REPORT error
        : ENDIF
        : IF NXM bit did not clear when read
        : :  THEN REPORT error
        : ENDIF
        : IF unexpected SSYN asserted
        : :  THEN REPORT error
        : ENDIF
        ENDSUBTEST NXM Error
```

Errors:

3.8.1.22 Map Invalid

This subtest checks that the UBI refuses to issue SSYN if the UBE at- tempts to access a map entry which has the valid bit turned off.

Subtest steps:

```
SUBTEST Map Invalid
: Invalidate first valid Map Entry
: Set up DATI to reference first valid Map Entry
: CLEAR UBE Data register
: Load pattern into memory location
: Execute DATI
: WAIT
: IF SSYN received
: : THEN REPORT no-timeout error
: ENDIF
ENDSUBTEST Map Invalid
```

Errors:

3.8.2 UBE Multi-transfer Test

This test supports up to four UBE's if they are attached and selected for testing. It consists of two subtests, the first is a multi-transfer subtest that starts traffic on the bus simultaneously and the second is a multi-transfer subtest that will have UBE's doing various trans- fers and/or interrupts at different request levels. Both subtests are designed to check CPU handling capabilities. This test is modeled after the existing PDP-11 Unibus System Exerciser, CZKUAE0. Note that the UBEs MUST be addressed and vectored as specified in the BUS EXERCISER ENGINEERING SPECIFICATION, i.e., the first device must be at address 777000 (octal) with vector 510 (octal), the second at address 777020 (octal) with vector 514 (octal), etc.

3.8.2.1 UBE Multi-transfer 1

This subtest will attempt to create traffic on the Unibus and check that the CPU can handle the data transactions without errors. All se- lected UBE's are set up and started simultaneously to cause the bus traffic. The functions cycle through the map entries using byte offset mode and are set up as follows:

UBE 0 - DATIP/DATOB single word BR6 transfer with a rotate data left after DATIP, interrupt on done, 2000 cycles.
UBE 1 - DATIP/DATO single word NPR transfer without rotate, interrupt on done BR7, 2000 cycles.
UBE 2 - DATO single word NPR transfer, interrupt on done BR7, 1000 cycles.
UBE 3 - DATO single word BR5 transfer, interrupt on done BR5, 1000 cycles.

Subtest steps:

```
BGNSUBTEST Multitransfer 1
:  DO FOR UBE Number = {0,1,2,3}
:  :  PROBE Data Register
:  :  IF NO ACCESS
:  :  :  THEN DO
:  :  :  :  REPORT ERROR
:  :  :  :  EXIT Test
:  :  :  ENDDO
:  :  ENDIF
:  ENDDO
:  DO FOR UBE Number = {0,1,2,3}
:  :  Set up UBE transfer
:  ENDDO
:  START Timer
:  SET Simultaneous GO bit
:  WAIT UNTIL All transfers stopped
:  DO FOR UBE Number = {0,1,2,3}
:  :  IF Data or Execution error
:  :  :  THEN REPORT error
:  :  ENDIF
:  ENDDO
ENDSUBTEST Multitransfer 1
```

Errors:

3.8.2.2 UBE Multi-transfer 2

This subtest will have all selected UBE's doing various transfer and/or interrupts at different request levels to further check CPU handling ablity. The functions cycle through the map entries using byte offset mode with each data pattern being rotated after each block transfer. The following functions are performed:

UBE 0 - DATOB double word NPR transfers, data from cycle count register, interrupt on done BR6, 2000 cycles.
UBE 1 - DATIP/DATO single word NPR transfers, with rotate after DATIP, interrupt on done BR7, 1000 cycles.
UBE 2 - DATI double word BR5 transfers, 1000 cycles, interrupt on done BR5.
UBE 3 - DATI single word BR7 transfers with an interrupt after each transfer, 3000 cycles.

Subtest steps:

```
BGNSUBTEST Multitransfer 2
:  DO FOR UBE Number = {0,1,2,3}
:  :  Set up UBE transfer
:  ENDDO
:  START Timer
:  SET Simultaneous GO bit
:  WAIT UNTIL All transfers stopped
```

```
    : DO FOR UBE Number = {0,1,2,3}
    : : IF Data or Execution error
    : : : THEN REPORT error
    : : ENDIF
    : ENDDO
    ENDSUBTEST Multitransfer 2
```

Errors:

3.9 ENKAXI: MEMORY TEST

This module does a quick test of main memory for the VAX 11/730 CPU. First memory is sized and compared against the memory size stored in CSR2 by the micro code and then a march test is done on all existing memory above that which is allocated to the Diagnostic Supervisor or this diagnostic. Any gaps found

3.9.0.1 Memory Size

This subtest sizes memory and then compares memory found to the size stored in memory CSR2.

Subtest steps:

```
    SUBTEST Memory Size
    : Get expected size from ka p table
    : Read memory CSR3 (memory found at power up by micro code)
    : Size memory
    : Compare two sizes
    : IF size is not the same
    : : THEN
    : : Report Memory size error
    : ENDIF
    ENDSUBTEST Memory Size
```

3.9.0.2 Data Path

This subtest checks the data path for stuck at one, stuck at zero and shorted data lines. This is accomplished by floating a one and a zero through the data. If an error is detected it is reported with information describing the nature of the error.

Subtest steps:

```
    SUBTEST Data Path
    : IF REPORT SB ERRORS
    : : THEN SET Memory CSR1 Disable ECC
```

```
        : ENDIF
        : Initialize data pattern
        : REPEAT
        : : Write pattern
        : : Read pattern
        : : IF pattern incorrect
        : : : THEN
        : : : Report error
        : : ENDIF
        : : Update pattern
        : : UNTIL all patterns done
        : ENDREPEAT
        ENDSUBTEST Data Path
```

3.9.0.3 Memory March

This subtest does a march thru all of memory above that which is allocated to the supervisor. A background pattern of all zeros is written into memory. Starting with location @A_FREE_MEM thru all available memory, the following is done. First, the background pattern is checked (i.e., checked for stuck or shorted address lines), then a pattern of all ones is written and checked. A reverse march is then executed, starting at the highest usable memory location, checking that the old pattern of all ones is still present (again, checking for stuck or shorted address lines) and loading a new pattern of all zeroes. The new pattern is also checked and the address is then decremented. This process assures also that there are no stuck data bits at any location. If a NXM machine check occurs while accessing expected good memory an error is reported. This test skips over "holes" in memory, using the map generated in the sizing routine.

Subtest steps:

```
        SUBTEST Memory March
        : DO FOR each physical memory location beyond supervisor
        : : Clear locations under test
        : ENDDO
        : DO FOR each physical memory location beyond supervisor
        : : IF data error
        : : : THEN REPORT Error
        : : ENDIF
        : : SET all bits at location
        : ENDDO
        : REVERSE march direction
        : DO FOR each physical memory location beyond supervisor
        : : IF data error
        : : : THEN REPORT error
        : : ENDIF
        : : CLEAR location
        : : IF location not clear
        : : : THEN REPORT Error
```

```
: : ENDIF
: ENDDO
ENDSUBTEST Memory March
```

3.10 ENKAXJ: FAST CONTROL STORE INTERRUPT

It was agreed at the Functional Specification Review that this module will not be implemented. The microcode requirements of the Fast Interrupt feature make testing this function not feasible. Possibly this issue could be addressed by IDC macro or micro diagnostics.

3.11 ENKAXK: LDPCTX (Bliss Module)

This module sets up each test case. The only legal mode for a LDPCTX instruction is kernel. A LDPCTX can only execute of a kernel or interrupt stack and always ends on the kernel stack. This module also sets up the initial and expected data for the Process Control Block and the registers involved are loaded with bakground data. This module also contains the error print and data compare routines for test verification.

3.12 ENKAXL: LDPCTX (Macro Module)

This module contains the control program which uses data set up in ENKAXK to run the different test cases. The routine Execute is called every test case and checks are made at the end of Execute to make sure the instruction is executed correctly.

```
                                   +--------------------------+
                                   ! Object Module Synopsis !
                                   +--------------------------+

Module Name    Ident             Bytes      File                               Creation Date        Creator
-----------    -----             -----      -----                              -------------        -------
ENKAX1         1-3                1961 WRKD$0:[PAN.ENKAX]ENKAX1.OBJ;1         4-AUG-1983 14:18  VAX-11 Macro V03-00
ENKAXA         1-3                1576 WRKD$0:[PAN.ENKAX]ENKAXA.OBJ;2         3-AUG-1983 13:42  VAX-11 Macro V03-00
ENKAXC         1-3                2317 WRKD$0:[PAN.ENKAX]ENKAXC.OBJ;2         3-AUG-1983 13:42  VAX-11 Macro V03-00
ENKAXD         1-3                9189 WRKD$0:[PAN.ENKAX]ENKAXD.OBJ;2         3-AUG-1983 13:43  VAX-11 Macro V03-00
ENKAXF         1-3                3204 WRKD$0:[PAN.ENKAX]ENKAXF.OBJ;2         3-AUG-1983 13:46  VAX-11 Macro V03-00
ENKAXG         1-3               18222 WRKD$0:[PAN.ENKAX]ENKAXG.OBJ;1         4-AUG-1983 11:08  VAX-11 Macro V03-00
ENKAXH         1-3               15423 WRKD$0:[PAN.ENKAX]ENKAXH.OBJ;4         3-AUG-1983 14:13  VAX-11 Macro V03-00
ENKAXI         1-3                2400 WRKD$0:[PAN.ENKAX]ENKAXI.OBJ;2         3-AUG-1983 13:56  VAX-11 Macro V03-00
ENKAXK         1.3                3140 WRKD$0:[PAN.ENKAX]ENKAXK.OBJ;3         4-Aug-1983 13:42  VAX-11 Bliss-32 V3-713
ENKAXL         1-3                1400 WRKD$0:[PAN.ENKAX]ENKAXL.OBJ;2         3-AUG-1983 13:59  VAX-11 Macro V03-00
DS             0                     0 SYS$SYSROOT:[SYSLIB]DS.STB;1           5-JAN-1983 15:27  VAX-11 Linker V3A-16

                                  +----------------------------+
                                  ! Program Section Synopsis !
                                  +----------------------------+

Psect Name     Module Name       Base     End           Length             Align                  Attributes
----------     -----------       ----     ---           ------             -----                  ----------
$HEADER                         00000200 00000291 00000092 (      146.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,NOEXE,  RD,NOWRT,NOVEC
               ENKAX1           00000200 00000291 00000092 (      146.) PAGE 9
$OWN$                           00000294 000002A3 00000010 (       16.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,NOEXE,  RD,  WRT,NOVEC
               ENKAXK           00000294 000002A3 00000010 (       16.) LONG 2
$PLIT$                          000002A4 0000058F 000002EC (      748.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,NOEXE,  RD,NOWRT,NOVEC
               ENKAXK           000002A4 0000058F 000002EC (      748.) LONG 2
$TSTCNT                         00000590 00000593 00000004 (        4.) LONG 2 NOPIC,USR,OVR,REL,LCL,NOSHR,NOEXE,  RD,NOWRT,NOVEC
               ENKAXA           00000590 00000593 00000004 (        4.) LONG 2
               ENKAXC           00000590 00000593 00000004 (        4.) LONG 2
               ENKAXD           00000590 00000593 00000004 (        4.) LONG 2
               ENKAXF           00000590 00000593 00000004 (        4.) LONG 2
               ENKAXG           00000590 00000593 00000004 (        4.) LONG 2
               ENKAXH           00000590 00000593 00000004 (        4.) LONG 2
               ENKAXI           00000590 00000593 00000004 (        4.) LONG 2
               ENKAXK           00000590 00000593 00000004 (        4.) LONG 2
               ENKAXL           00000590 00000593 00000004 (        4.) LONG 2
. BLANK .                       00000594 000007DF 0000024C (      588.) BYTE 0 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,  WRT,NOVEC
               ENKAXL           00000594 000007DF 0000024C (      588.) BYTE 0
ARGLIST                         000007E0 00000B1B 0000033C (      828.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
               ENKAXA           000007E0 00000803 00000024 (       36.) LONG 2
               ENKAXC           00000804 00000827 00000024 (       36.) LONG 2
               ENKAXD           00000828 000008DB 000000B4 (      180.) LONG 2
               ENKAXF           000008DC 0000090B 00000030 (       48.) LONG 2
               ENKAXG           0000090C 000009D7 000000CC (      204.) LONG 2
               ENKAXH           000009D8 00000AF7 00000120 (      288.) LONG 2
               ENKAXI           00000AF8 00000B1B 00000024 (       36.) LONG 2
CLEANUP                         00000B1C 00000C0E 000000F3 (      243.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,  WRT,NOVEC
               ENKAX1           00000B1C 00000C0E 000000F3 (      243.) LONG 2
CODE                            00000C10 00001293 00000684 (     1668.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
               ENKAXK           00000C10 00001293 00000684 (     1668.) LONG 2
DATA                            00001400 000015C4 000001C5 (      453.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,  WRT,NOVEC
```

```
ZZ-ENKAX-1.3     Map                                                  4-AUG-1983 14:22     VAX-11 Linker V03-03          Page    2
WRKD$0:[PAN.ENKAX]ENKAX.EXE;1

Psect Name      Module Name       Base     End           Length          Align                 Attributes
----------      -----------       ----     ---           ------          -----                 ----------
DATA                            00001400 000015C4 000001C5 (        453.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,  WRT,NOVEC
                ENKAX1          00001400 000015C4 000001C5 (        453.) PAGE 9
DISPATCH                        000015C8 000016CF 00000108 (        264.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,NOEXE,  RD,NOWRT,NOVEC
                ENKAXA          000015C8 000015DF 00000018 (         24.) LONG 2
                ENKAXC          000015E0 000015F7 00000018 (         24.) LONG 2
                ENKAXD          000015F8 00001627 00000030 (         48.) LONG 2
                ENKAXF          00001628 0000163F 00000018 (         24.) LONG 2
                ENKAXG          00001640 0000166F 00000030 (         48.) LONG 2
                ENKAXH          00001670 0000169F 00000030 (         48.) LONG 2
                ENKAXI          000016A0 000016B7 00000018 (         24.) LONG 2
                ENKAXL          000016B8 000016CF 00000018 (         24.) LONG 2
DISPATCH_X                      000016D0 000016E7 00000018 (         24.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,NOEXE,  RD,NOWRT,NOVEC
                ENKAX1          000016D0 000016E7 00000018 (         24.) LONG 2
ENKAX1                          00001800 0000198E 0000018F (        399.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAX1          00001800 0000198E 0000018F (        399.) PAGE 9
ENKAXA                          00001A00 00001D10 00000311 (        785.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXA          00001A00 00001D10 00000311 (        785.) PAGE 9
ENKAXC                          00001E00 0000244E 0000064F (       1615.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXC          00001E00 0000244E 0000064F (       1615.) PAGE 9
ENKAXD                          00002450 000031FC 00000DAD (       3501.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,  WRT,NOVEC
                ENKAXD          00002450 000031FC 00000DAD (       3501.) LONG 2
ENKAXF                          00003200 00003A4D 0000084E (       2126.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXF          00003200 00003A4D 0000084E (       2126.) PAGE 9
ENKAXG                          00003C00 000058A4 00001CA5 (       7333.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXG          00003C00 000058A4 00001CA5 (       7333.) PAGE 9
ENKAXH                          00005A00 000074B4 00001AB5 (       6837.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXH          00005A00 000074B4 00001AB5 (       6837.) PAGE 9
ENKAXI                          00007600 00007B65 00000566 (       1382.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXI          00007600 00007B65 00000566 (       1382.) PAGE 9
GLOBALS                         00007B68 00007E27 000002C0 (        704.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,NOEXE,  RD,  WRT,NOVEC
                ENKAXK          00007B68 00007E27 000002C0 (        704.) LONG 2
INITIALIZE                      00007E28 00008091 0000026A (        618.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,  WRT,NOVEC
                ENKAX1          00007E28 00008091 0000026A (        618.) LONG 2
SUMMARY                         00008094 000080E1 0000004E (         78.) LONG 2 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,  WRT,NOVEC
                ENKAX1          00008094 000080E1 0000004E (         78.) LONG 2
TEST_001                        00008200 000084D6 000002D7 (        727.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXA          00008200 000084D6 000002D7 (        727.) PAGE 9
TEST_002                        00008600 0000887D 0000027E (        638.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXC          00008600 0000887D 0000027E (        638.) PAGE 9
TEST_003                        00008A00 00009567 00000B68 (       2920.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXD          00008A00 00009567 00000B68 (       2920.) PAGE 9
TEST_004                        00009600 00009FE7 000009E8 (       2536.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXD          00009600 00009FE7 000009E8 (       2536.) PAGE 9
TEST_005                        0000A000 0000A3E9 000003EA (       1002.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXF          0000A000 0000A3E9 000003EA (       1002.) PAGE 9
TEST_006                        0000A400 0000A910 00000511 (       1297.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXG          0000A400 0000A910 00000511 (       1297.) PAGE 9
TEST_007                        0000AA00 0000CE77 00002478 (       9336.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXG          0000AA00 0000CE77 00002478 (       9336.) PAGE 9
TEST_008                        0000D000 0000E9BE 000019BF (       6591.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXH          0000D000 0000E9BE 000019BF (       6591.) PAGE 9
TEST_009                        0000EA00 0000F076 00000677 (       1655.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
```

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Psect Name      Module Name       Base     End           Length           Align                 Attributes
----------      -----------       ----     ---           ------           -----                 ----------
TEST_009                        0000EA00 0000F076 00000677 (       1655.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXH          0000EA00 0000F076 00000677 (       1655.) PAGE 9
TEST_010                        0000F200 0000F5B9 000003BA (        954.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXI          0000F200 0000F5B9 000003BA (        954.) PAGE 9
TEST_011                        0000F600 0000F90F 00000310 (        784.) PAGE 9 NOPIC,USR,CON,REL,LCL,NOSHR,  EXE,  RD,NOWRT,NOVEC
                ENKAXL          0000F600 0000F90F 00000310 (        784.) PAGE 9

                                           +------------------+
                                           ! Symbols By Name  !
                                           +------------------+

Symbol                          Value       Symbol                        Value       Symbol                        Value
------                          -----       ------                        -----       ------                        -----
$ENV                            00000001    CHI$V_CHNINT                  00000000    CHS$M_PGMHDE                  00000800
$MO                             00000001    CHI$V_DEVINT                  00000001    CHS$M_SYSERR                  00000001
ACTUAL_EXCEPT                   00007B68-R  CHI$V_IPL                     00000002    CHS$M_SYSMEM                  00000200
ACTUAL_PCB                      00007CA0-R  CHM$_FORWARD                  00000000    CHS$M_SYSSBI                  00000400
ACTUAL_PSL                      00007E20-R  CHM$_INVALIDATE               00000001    CHS$V_BUSIC                   00000017
ACTUAL_REG                      00007DC0-R  CHM$_MAP                      00000002    CHS$V_BUSINIT                 00000016
ALL                             00000008    CHM$_MFWDN                    00000002    CHS$V_BUSNXM                  0000001B
A_BUFFER_BEGIN                  00001800-R  CHM$_MFWDNO                   0000000A    CHS$V_BUSPDN                  00000018
A_BUFFER_END                    00001804-R  CHM$_MFWDV                    00000003    CHS$V_CHNDPE                  00000006
A_FREE_MEM                      00001848-R  CHM$_MFWDVO                   0000000B    CHS$V_CHNERR                  00000001
A_HALT_BUFFER                   00001810-R  CHM$_MREVN                    00000006    CHS$V_CHNMPE                  00000007
A_MCHK_BUFFER                   00001818-R  CHM$_MREVNO                   0000000E    CHS$V_CHPFOT                  00000008
A_PSLMNE                        00001915-R  CHM$_MREVV                    00000007    CHS$V_DEVBUS                  00000004
A_PWR_BUFFER                    00001808-R  CHM$_MREVVO                   0000000F    CHS$V_DEVERR                  00000002
A_UBE_BUFFER_0                  00001828-R  CHM$_NFWDN                    00000000    CHS$V_DEVTO                   00000005
A_UBE_BUFFER_1                  00001830-R  CHM$_NREVN                    00000004    CHS$V_MBAATN                  00000014
A_UBE_BUFFER_2                  00001838-R  CHM$_OFFSET                   00000008    CHS$V_MBACPE                  00000015
A_UBE_BUFFER_3                  00001840-R  CHM$_REVERSE                  00000004    CHS$V_MBADTB                  00000012
A_WCS_BUFFER                    00001820-R  CHS$M_BUSIC                   00800000    CHS$V_MBADTC                  00000013
BE0_UNIT_NO                     0000187D-R  CHS$M_BUSINIT                 00400000    CHS$V_MBAEXC                  00000010
BE1_UNIT_NO                     00001881-R  CHS$M_BUSNXM                  08000000    CHS$V_MBANED                  00000011
BE2_UNIT_NO                     00001885-R  CHS$M_BUSPDN                  01000000    CHS$V_MBAWCKLWR               00000019
BE3_UNIT_NO                     00001889-R  CHS$M_CHNDPE                  00000040    CHS$V_MBAWCKUPR               0000001A
B_TU58_DRIVE                    0000186C-R  CHS$M_CHNERR                  00000002    CHS$V_PGMERR                  00000003
CHC$_ABORT                      00000002    CHS$M_CHNMPE                  00000080    CHS$V_PGMHDE                  0000000B
CHC$_CLEAR                      00000006    CHS$M_CHPFOT                  00000100    CHS$V_SYSERR                  00000000
CHC$_CLRDFT                     00000009    CHS$M_DEVBUS                  00000010    CHS$V_SYSMEM                  00000009
CHC$_DSINT                      00000005    CHS$M_DEVERR                  00000004    CHS$V_SYSSBI                  0000000A
CHC$_ENINT                      00000004    CHS$M_DEVTO                   00000020    CPU$V_COMET                   00000002
CHC$_INITA                      00000000    CHS$M_ERRANY                  0000000F    CPU$V_HS                      00000000
CHC$_INITB                      00000001    CHS$M_MBAATN                  00100000    CPU$V_STAR                    00000001
CHC$_PURGE                      00000003    CHS$M_MBACPE                  00200000    DEFAULT                       00000000
CHC$_SETDFT                     00000008    CHS$M_MBADTB                  00040000    DS$ABORT                      00010020
CHC$_STATUS                     00000007    CHS$M_MBADTC                  00080000    DS$ASKADR                     00010090
CHECK_STACK                     00007B70-R  CHS$M_MBAEXC                  00010000    DS$ASKDATA                    00010080
CHI$M_CHNINT                    00000001    CHS$M_MBANED                  00020000    DS$ASKLGCL                    00010098
CHI$M_DEVINT                    00000002    CHS$M_MBAWCKLWR               02000000    DS$ASKSTR                     000100A0
CHI$M_IPL                       0000007C    CHS$M_MBAWCKUPR               04000000    DS$ASKVLD                     00010088
CHI$S_IPL                       00000005    CHS$M_PGMERR                  00000008    DS$ATTACH                     000101A8
```

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Symbol                   Value      Symbol                   Value      Symbol                   Value
------                   -----      ------                   -----      ------                   -----
DS$BGNSUB                00010030   DS$K_BLEQ_M              0000000E   DS$_IHWE                 00660060
DS$BRANCH                000100A8   DS$K_BLSSU_B             00000001   DS$_ILLCHAR              00660018
DS$BREAK                 00010058   DS$K_BLSSU_M             0000000D   DS$_ILLPAGCNT            00660078
DS$CANWAIT               00010070   DS$K_BLSS_B              00000000   DS$_ILLUNIT              00660100
DS$CHANNEL               00010180   DS$K_BLSS_M              0000000C   DS$_INSFMEM              00660050
DS$CKLOOP                00010040   DS$K_BNEQU_B             0000000B   DS$_IPL2HI               006600B8
DS$CLRVEC                00010168   DS$K_BNEQU_M             00000017   DS$_IVADDR               00660040
DS$CNTRLC                00010078   DS$K_BNEQ_B              0000000A   DS$_IVVECT               00660038
DS$CVTREG                000100B0   DS$K_BNEQ_M              00000016   DS$_KRNLSTK              00660090
DS$ENDPASS               00010010   DS$K_BNERROR             00000027   DS$_LOGIC                00660070
DS$ENDSUB                00010038   DS$K_BVC_M               00000019   DS$_MCHK                 00660088
DS$ERRDEV                000100C8   DS$K_BVS_M               00000018   DS$_MMOFF                00660058
DS$ERRHARD               000100D0   DS$K_ERROR               00000002   DS$_NEEDUNIT             006600F8
DS$ERRPREP               00010108   DS$K_NORMAL              00000001   DS$_NOPCS                00660110
DS$ERRSOFT               000100D8   DS$K_SEVERE              00000004   DS$_NORMAL               00660001
DS$ERRSYS                000100C0   DS$K_SUBSYS              00000066   DS$_NOSUPPORT            006600B1
DS$ESCAPE                00010050   DS$K_WARNING             00000000   DS$_NOTDON               00660030
DS$FREEDBGSYM            000101B8   DS$LOAD                  00010198   DS$_NOTIMP               006600B0
DS$GETBUF                00010120   DS$LOADPCS               000101C0   DS$_NULLSTR              00660010
DS$GETMEM                00010130   DS$MAPDBGBLOCK           00010118   DS$_OVERFLOW             00660008
DS$GPHARD                00010018   DS$MMOFF                 00010158   DS$_POWER                00660098
DS$HELP                  000101B0   DS$MMON                  00010150   DS$_PROGERR              00660020
DS$INITSCB               00010170   DS$MOVPHY                00010148   DS$_SEVERE               00660004
DS$INLOOP                00010048   DS$MOVVRT                00010140   DS$_TRANSL               006600A0
DS$K_BBC                 0000001D   DS$PARSE                 000100B8   DS$_TRUNCATE             00660028
DS$K_BBCC                00000021   DS$PRINTB                000100E0   DS$_UNEXPINT             006600D8
DS$K_BBCCI               00000023   DS$PRINTF                000100F0   DS$_VASFULL              00660048
DS$K_BBCS                0000001F   DS$PRINTS                000100F8   DS$_WARNING              00660000
DS$K_BBS                 0000001C   DS$PRINTSIG              00010100   DSA$AL_APTMAIL           0000FE00
DS$K_BBSC                00000020   DS$PRINTX                000100E8   DSA$AT_APTTXT            0000FA00
DS$K_BBSS                0000001E   DS$PROBE                 000101A0   DSA$GL_APTCOM            0000FE04
DS$K_BBSSI               00000022   DS$RELBUF                00010128   DSA$GL_DEVLEN            0000FE58
DS$K_BCC_M               0000001B   DS$RELMEM                00010138   DSA$GL_ERRNO             0000FE44
DS$K_BCS_M               0000001A   DS$SETIPL                00010178   DSA$GL_EVENT             0000FE48
DS$K_BEQLU_B             00000005   DS$SETMAP                00010188   DSA$GL_FLAGS             0000FE00
DS$K_BEQLU_M             00000011   DS$SETPRIEXV             00010110   DSA$GL_MSGTYP            0000FE40
DS$K_BEQL_B              00000004   DS$SETVEC                00010160   DSA$GL_PASSES            0000FE08
DS$K_BEQL_M              00000010   DS$SHOCHAN               00010190   DSA$GL_PASSNO            0000FE54
DS$K_BERROR              00000026   DS$SUMMARY               00010028   DSA$GL_SECTNO            0000FE10
DS$K_BGEQU_B             00000007   DS$WAITMS                00010060   DSA$GL_SID               0000FE14
DS$K_BGEQU_M             00000013   DS$WAITUS                00010068   DSA$GL_SUBTNO            0000FE4C
DS$K_BGEQ_B              00000006   DS$_ARITH                006600D0   DSA$GL_TESTNO            0000FE50
DS$K_BGEQ_M              00000012   DS$_BADLINK              006600F0   DSA$GL_UNITS             0000FE0C
DS$K_BGTRU_B             00000009   DS$_BADTYPE              006600E8   DSA$GQ_MSGPTR            0000FE68
DS$K_BGTRU_M             00000015   DS$_CHME                 006600A8   DSA$GT_DEVNAM            0000FE5C
DS$K_BGTR_B              00000008   DS$_CHMK                 006600E0   DSA$M_APT                80000000
DS$K_BGTR_M              00000014   DS$_DEVNAME              00660108   DSA$M_BELL               00000008
DS$K_BLBC                00000025   DS$_ERROR                00660002   DSA$M_BINARY             00000002
DS$K_BLBS                00000024   DS$_FHWE                 00660068   DSA$M_CRD_AUTOTEST       00000800
DS$K_BLEQU_B             00000003   DS$_FRAGBUF              00660080   DSA$M_CRD_MENUTEST       00010000
DS$K_BLEQU_M             0000000F   DS$_ICBUSY               006600C8   DSA$M_CRD_TRACE          00020000
DS$K_BLEQ_B              00000002   DS$_ICERR                006600C0   DSA$M_DEBUG              04000000
```

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Symbol               Value       Symbol           Value       Symbol           Value
------               -----       ------           -----       ------           -----
DSA$M_HALT           00000001    IPR              00000006    PR$_ICR          0000001A
DSA$M_IE1            00000010    KA730_REV_54     03003600    PR$_IPL          00000012
DSA$M_IE2            00000020    KA_PTABLE        0000198B-R  PR$_ISP          00000004
DSA$M_IE3            00000040    KA_UNIT_NO       00001871-R  PR$_KSP          00000000
DSA$M_IES            00000080    LDPCTX           0000000B    PR$_MAPEN        00000038
DSA$M_LOAD_DEBUGGER  40000000    L_ACT_ISP        00001858-R  PR$_MCESR        00000026
DSA$M_LOOP           00000004    L_ACT_KSP        00001854-R  PR$_MCTL1        00000044
DSA$M_NORPT          08000000    L_ACT_PSL        0000185C-R  PR$_MCTL2        00000045
DSA$M_OPER           00001000    L_ACT_SP         00001850-R  PR$_MDCR1        00000049
DSA$M_PASS0          20000000    L_EXP_AP         000018C5-R  PR$_MEAR         00000048
DSA$M_PROMPT         00002000    L_EXP_FP         000018C9-R  PR$_MECCR        0000004B
DSA$M_QA             00008000    L_EXP_ISP        000018D5-R  PR$_MEDR         0000004A
DSA$M_QUICK          00000100    L_EXP_KSP        000018D1-R  PR$_MGEN         00000046
DSA$M_SEARCH         00004000    L_EXP_PSL        000018D9-R  PR$_MTBER        00000047
DSA$M_TRACE          00000400    L_EXP_SP         000018CD-R  PR$_NICR         00000019
DSA$M_USER           10000000    L_ISP            00001864-R  PR$_P0BR         00000008
DSA$M_VERIFY         00000200    L_KA_FLAGS       0000188D-R  PR$_P0LR         00000009
DSA$V_APT            0000001F    L_KSIZE_PTBL     00001891-R  PR$_P1BR         0000000A
DSA$V_BELL           00000003    L_KSP            00001860-R  PR$_P1LR         0000000B
DSA$V_BINARY         00000001    L_LAST_UBE       00001868-R  PR$_PAMACC       00000040
DSA$V_CRD_AUTOTEST   0000000B    MANUAL           00000001    PR$_PAMLOC       00000041
DSA$V_CRD_MENUTEST   00000010    MCHK             00000005    PR$_PCBB         00000010
DSA$V_CRD_TRACE      00000011    MEM              00000009    PR$_PME          0000003D
DSA$V_DEBUG          0000001A    MODE             00007B71-R  PR$_RXCS         00000020
DSA$V_HALT           00000000    MODELIST         00001956-R  PR$_RXDB         00000021
DSA$V_IE1            00000004    OPR_ABORT        00007E24-R  PR$_SBIER        00000034
DSA$V_IE2            00000005    ORIG_PCBB        00007B7C-R  PR$_SBIFS        00000030
DSA$V_IE3            00000006    PART_INIT        0000158B-R  PR$_SBIMT        00000033
DSA$V_IES            00000007    PCB_ERR_FLAG     00007B74-R  PR$_SBIQC        00000036
DSA$V_LOAD_DEBUGGER  0000001E    POWER            00000003    PR$_SBIS         00000031
DSA$V_LOOP           00000002    PR$S_SID_ECO     00000009    PR$_SBISC        00000032
DSA$V_NORPT          0000001B    PR$S_SID_PL      00000003    PR$_SBITA        00000035
DSA$V_OPER           0000000C    PR$S_SID_SN      0000000C    PR$_SBR          0000000C
DSA$V_PASS0          0000001D    PR$S_SID_TYPE    00000008    PR$_SCBB         00000011
DSA$V_PROMPT         0000000D    PR$V_SID_ECO     0000000F    PR$_SID          0000003E
DSA$V_QA             0000000F    PR$V_SID_PL      0000000C    PR$_SID_TYP730   00000003
DSA$V_QUICK          00000008    PR$V_SID_SN      00000000    PR$_SID_TYP750   00000002
DSA$V_SEARCH         0000000E    PR$V_SID_TYPE    00000018    PR$_SID_TYP780   00000001
DSA$V_TRACE          0000000A    PR$_ACCR         00000029    PR$_SID_TYP7VV   00000004
DSA$V_USER           0000001C    PR$_ACCS         00000028    PR$_SID_TYPMAX   00000004
DSA$V_VERIFY         00000009    PR$_ASTLVL       00000013    PR$_SIRR         00000014
ERROR_CHECK          000030D5-R  PR$_CADR         00000025    PR$_SISR         00000015
EXECUTE              0000F675-R  PR$_CAER         00000027    PR$_SLR          0000000D
EXPECTED_EXCEPT      00007B6C-R  PR$_CMIERR       00000017    PR$_SSP          00000002
EXPECT_PCB           00007C40-R  PR$_CRBT         00000043    PR$_TBCHK        0000003F
EXPECT_REG           00007D60-R  PR$_CSRD         0000001D    PR$_TBDR         00000024
GPR_TABLE            00001895-R  PR$_CSRS         0000001C    PR$_TBIA         00000039
HALT                 00000004    PR$_CSTD         0000001F    PR$_TBIS         0000003A
HANDLER              00000D0A-R  PR$_CSTS         0000001E    PR$_TODR         0000001B
HARDCNT              00001400-R  PR$_CSWP         00000042    PR$_TXCS         00000022
INIT_PCB             00007BE0-R  PR$_ESP          00000001    PR$_TXDB         00000023
INIT_REG             00007D00-R  PR$_ICCS         00000018    PR$_UBRESET      00000037
```

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Symbol              Value       Symbol              Value       Symbol              Value
------              -----       ------              -----       ------              -----
PR$_USP             00000003    PSL$V_Z             00000002    SYS$CLREF           00010298
PR$_WCSA            0000002C    PSL$V_ZBIT          00000002    SYS$CONNECT         000105C0
PR$_WCSD            0000002D    REG_DATA            00007B80-R  SYS$DALLOC          000102D8
PRINT_ERR           00000C10-R  REG_ERR_FLAG        00007B78-R  SYS$DASSGN          000102E0
PSL$C_EXEC          00000001    REG_TABLE           000018DD-R  SYS$DISCONNECT      000105D0
PSL$C_KERNEL        00000000    SAVE_RESULTS        0000F76E-R  SYS$FAO             00010350
PSL$C_SUPER         00000002    SCB$L_ACCESS        00000020    SYS$FAOL            00010358
PSL$C_USER          00000003    SCB$L_ARITH         00000034    SYS$GET             00010580
PSL$K_EXEC          00000001    SCB$L_BREAK         0000002C    SYS$GETCHN          000104C8
PSL$K_KERNEL        00000000    SCB$L_CHME          00000044    SYS$GETTIM          00010378
PSL$K_SUPER         00000002    SCB$L_CHMK          00000040    SYS$LKWSET          000103A0
PSL$K_USER          00000003    SCB$L_CHMS          00000048    SYS$NUMTIM          000103B8
PSL$M_C             00000001    SCB$L_CHMU          0000004C    SYS$OPEN            00010608
PSL$M_CBIT          00000001    SCB$L_COMPAT        00000030    SYS$QIO             000103C8
PSL$M_CM            80000000    SCB$L_KNLSTK        00000008    SYS$QIOW            00010200
PSL$M_CURMOD        03000000    SCB$L_MACHCHK       00000004    SYS$READ            00010590
PSL$M_DV            00000080    SCB$L_OPCCUS        00000014    SYS$READEF          000103D0
PSL$M_FPD           08000000    SCB$L_OPCDEC        00000010    SYS$SETAST          000103F8
PSL$M_FU            00000040    SCB$L_POWER         0000000C    SYS$SETEF           00010400
PSL$M_IPL           001F0000    SCB$L_RADRMOD       0000001C    SYS$SETIMR          00010420
PSL$M_IS            04000000    SCB$L_ROPRAND       00000018    SYS$SETPRI          00010428
PSL$M_IV            00000020    SCB$L_RXDB          000000F8    SYS$SETPRT          00010430
PSL$M_N             00000008    SCB$L_SFTLVL1       00000084    SYS$SETRWM          00010438
PSL$M_NBIT          00000008    SCB$L_SFTLVL10      000000A8    SYS$SETSWM          00010448
PSL$M_PRVMOD        00C00000    SCB$L_SFTLVL11      000000AC    SYS$ULKPAG          00010460
PSL$M_SAFBITS       000037FF    SCB$L_SFTLVL12      000000B0    SYS$ULWSET          00010468
PSL$M_TBIT          00000010    SCB$L_SFTLVL13      000000B4    SYS$UNWIND          00010470
PSL$M_TP            40000000    SCB$L_SFTLVL14      000000B8    SYS$WAITFR          00010478
PSL$M_V             00000002    SCB$L_SFTLVL15      000000BC    SYS$WFLAND          00010488
PSL$M_VBIT          00000002    SCB$L_SFTLVL2       00000088    SYS$WFLOR           00010490
PSL$M_Z             00000004    SCB$L_SFTLVL3       0000008C    T10_S1              0000F22A-R
PSL$M_ZBIT          00000004    SCB$L_SFTLVL4       00000090    T10_S2              0000F30F-R
PSL$S_CURMOD        00000002    SCB$L_SFTLVL5       00000094    T10_S3              0000F3BD-R
PSL$S_IPL           00000005    SCB$L_SFTLVL6       00000098    T1_S1               0000823E-R
PSL$S_PRVMOD        00000002    SCB$L_SFTLVL7       0000009C    T1_S2               00008318-R
PSL$V_C             00000000    SCB$L_SFTLVL8       000000A0    T1_S3               000083F9-R
PSL$V_CBIT          00000000    SCB$L_SFTLVL9       000000A4    T2_S1               0000867F-R
PSL$V_CM            0000001F    SCB$L_TBIT          00000028    T2_S2               00008701-R
PSL$V_CURMOD        00000018    SCB$L_TIMER         000000C0    T2_S3               00008796-R
PSL$V_DV            00000007    SCB$L_TRANSL        00000024    T3_S1               00008AAD-R
PSL$V_FPD           0000001B    SCB$L_TXDB          000000FC    T3_S2               00008B99-R
PSL$V_FU            00000006    SCB$L_ZERO          00000000    T3_S3               00008E01-R
PSL$V_IPL           00000010    SUM_K_SIZE          0000000C    T3_S4               00008F81-R
PSL$V_IS            0000001A    SUM_L_HARDCNT       00000000    T3_S5               000090F4-R
PSL$V_IV            00000005    SUM_Q_RUNTIME       00000004    T3_S6               00009268-R
PSL$V_N             00000003    SYS$ALLOC           00010238    T3_S7               000093DC-R
PSL$V_NBIT          00000003    SYS$ASCTIM          00010248    T4_S1               000096B1-R
PSL$V_PRVMOD        00000016    SYS$ASSIGN          00010250    T4_S2               000097E3-R
PSL$V_TBIT          00000004    SYS$BINTIM          00010258    T4_S3               00009915-R
PSL$V_TP            0000001E    SYS$CANCEL          00010260    T4_S4               00009A47-R
PSL$V_V             00000001    SYS$CANTIM          00010268    T4_S5               00009B9D-R
PSL$V_VBIT          00000001    SYS$CLOSE           000105B8    T4_S6               00009C9E-R
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                                                                     B  7
ZZ-ENKAX-1.3    Map                                                             Fiche 1  Frame B7                Sequence 79
WRKD$0:[PAN.ENKAX]ENKAX.EXE;1                                     4-AUG-1983 14:22     VAX-11 Linker V03-03                 Page     7

Symbol                           Value       Symbol                           Value       Symbol                           Value
-------                          -----       -------                          -----       -------                          -----
T4_S7                            00009DBD-R  TEST_003                         00008A24-R
T4_S8                            00009EC4-R  TEST_003_X                       00009560-R
T5_S1                            0000A056-R  TEST_004                         00009628-R
T5_S2                            0000A135-R  TEST_004_X                       00009FE0-R
T5_S3                            0000A214-R  TEST_005                         0000A020-R
T5_S4                            0000A2F3-R  TEST_005_X                       0000A3E2-R
T6_S1                            0000A5BE-R  TEST_006                         0000A418-R
T6_S2                            0000A6CC-R  TEST_006_X                       0000A909-R
T6_S3                            0000A7DA-R  TEST_007                         0000AA20-R
T7_S1                            0000ABD2-R  TEST_007_X                       0000CE70-R
T7_S10                           0000C0F5-R  TEST_008                         0000D020-R
T7_S11                           0000C4B0-R  TEST_008_X                       0000E998-R
T7_S12                           0000C845-R  TEST_009                         0000EA20-R
T7_S13                           0000CAA8-R  TEST_009_X                       0000F06F-R
T7_S14                           0000CC79-R  TEST_010                         0000F210-R
T7_S2                            0000AF68-R  TEST_010_X                       0000F5B2-R
T7_S3                            0000B16E-R  TEST_011                         0000F61C-R
T7_S4                            0000B2DE-R  TEST_011_X                       0000F908-R
T7_S5                            0000B4EB-R  TEST_CONTROL                     00000EF2-R
T7_S6                            0000B669-R  TU0_UNIT_NO                      00001875-R
T7_S7                            0000B86C-R  TU1_UNIT_NO                      00001879-R
T7_S8                            0000B9DC-R  TU58                             00000002
T7_S9                            0000BD81-R  UBI                              0000000A
T8_S1                            0000D03C-R  WCS                              00000007
T8_S10                           0000DA61-R
T8_S11                           0000DB81-R
T8_S12                           0000DCA5-R
T8_S13                           0000DE46-R
T8_S14                           0000DF74-R
T8_S15                           0000E090-R
T8_S16                           0000E1B2-R
T8_S17                           0000E336-R
T8_S18                           0000E48A-R
T8_S19                           0000E5DB-R
T8_S2                            0000D13A-R
T8_S20                           0000E6E1-R
T8_S21                           0000E7E8-R
T8_S22                           0000E8E0-R
T8_S3                            0000D1B1-R
T8_S4                            0000D24F-R
T8_S5                            0000D33D-R
T8_S6                            0000D4A9-R
T8_S7                            0000D65D-R
T8_S8                            0000D7E4-R
T8_S9                            0000D92A-R
T9_S1                            0000EAC0-R
T9_S2                            0000EDAE-R
TEMP_PSL                         000005F8-R
TEST_001                         00008224-R
TEST_001_X                       000084CF-R
TEST_002                         00008614-R
TEST_002_X                       00008876-R
```

```
ZZ-
ENK
1-3

20
64
21
2E

2A
53
4F
4E
2A
```

```
Symbol                      Value      Symbol                      Value      Symbol                      Value
------                      -----      ------                      -----      ------                      -----


        Key for special characters above:
             +-----------------+
             ! *  - Undefined  !
             ! U  - Universal  !
             ! R  - Relocatable !
             ! X  - External   !
             +-----------------+
                                                 +------------------+
                                                 ! Image Synopsis !
                                                 +------------------+

Virtual memory allocated:                        00000200 0000F9FF 0000F800 (63488. bytes, 124. pages)
Stack size:                                            0. pages
Image binary virtual block limits:                     1.       124. (   124. blocks)
Image name and identification:                   ENKAX 1-3
Number of files:                                      13.
Number of modules:                                    12.
Number of program sections:                           37.
Number of global symbols:                            663.
Number of image sections:                              1.
Image type:                                      SYSTEM.
Map format:                                      DEFAULT in file WRKD$0:[PAN.ENKAX]ENKAX.MAP;1
Estimated map length:                            88. blocks
                                              +----------------------+
                                              ! Link Run Statistics !
                                              +----------------------+

Performance Indicators                           Page Faults  CPU Time        Elapsed Time
----------------------                           -----------  --------        ------------
    Command processing:                                   53  00:00:00.25     00:00:03.42
    Pass 1:                                              236  00:00:01.77     00:00:05.28
    Allocation/Relocation:                                29  00:00:00.08     00:00:00.32
    Pass 2:                                              218  00:00:03.78     00:00:07.63
    Map data after object module synopsis:                94  00:00:01.67     00:00:02.22
    Symbol table output:                                   2  00:00:00.00     00:00:00.15
Total run values:                                        632  00:00:07.55     00:00:19.02

Using a working set limited to 600 pages and 105 pages of data storage (excluding image)

Total number object records read (both passes):   896
    of which 14 were in libraries and 28 were DEBUG data records containing 1647 bytes

Number of modules extracted explicitly             = 0
    with 1 extracted to resolve undefined symbols

0 library searches were for symbols not in the library searched

A total of 0 global symbol table records was written

/CONTIG/SYST=%X200/EXE=ENKAX/MAP=ENKAX ENKAX1+ENKAXA+ENKAXC+ENKAXD+ENKAXF+ENKAXG+ENKAXH+ENKAXI+ENKAXK+ENKAXL+SYS$LIBRARY:DS.STB
```

```
     (1)            1        ENKAX1: HEADER MODULE
     (2)           61        DECLARATIONS
     (3)          200        Program Header Data Block
     (3)          214        Dispatch Table
     (3)          227        Hardware Parameter Table
     (4)          241        Program Global Data Section
     (5)          288        Program Text Section
     (6)          335        Initialization Procedure
     (8)          460        Clean-up Procedure
     (9)          522        Summary Report Procedure
     (11)         595        Summary Information Block Initialization
     (13)         648        Summary Information Input Subroutine
```

```
0000               .SBTTL  ENKAX1: HEADER MODULE
0000               .TITLE  ENKAX1  VAX 11/730 Specific CPU Cluster Exerciser
0000               .IDENT  /1-3/
0000
0000       ;
0000       ; Copyright (C) 1981, 1982
0000       ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000       ;
0000       ; This software is furnished  under a license for use only on a single
0000       ; computer  system and  may be  copied only with  the inclusion of the
0000       ; above copyright notice.  This software, or any other copies thereof,
0000       ; may not be provided or  otherwise made available to any other person
0000       ; except for use on such system and to one who agrees to these license
0000       ; terms.  Title to and  ownership of the  software  shall at all times
0000       ; remain in DEC.
0000       ;
0000       ; The information in this software is subject to change without notice
0000       ; and should  not be construed  as a commitment  by Digital  Equipment
0000       ; Corporation.
0000       ;
0000       ; DEC assumes  no  responsibility  for  the use or  reliability of its
0000       ; software on equipment which is not supplied by DEC.
0000       ;
0000
0000       ;++
0000       ; Facility:      VAX Architecture Diagnostic.
0000       ;
0000       ; Abstract:      This module provides all the standard header informaton
0000       ;                and routines required to interface to the VAX Diagnostic
0000       ;                Supervisor.
0000       ;
0000       ; Environment:   VAX Diagnostic Supervisor.
0000       ;
0000       ; Author:        Rich Lewis      7-Jly-81         Version 1.0
0000       ;
0000       ; Modified by:   Kevin Martin    9-NOV-82         Version 1.1
0000       ;       01       Added modules ENKAXK and ENKAXL - LDPCTX reserved operand
0000       ;                test cases.
0000       ;                Bug fixes in module ENKAX1 ENKAXI and ENKAXH
0000       ;
0000       ;                Tai-Chun Pan    01-Apr-83        Version 1.2
0000       ;                Peter Green
0000       ;
0000       ;                Added quick flag on Test 7(TU58). If quick flag is set
0000       ;                will skip subtest 4 through subtest 11.  Added event flag 3.
0000       ;                If event flag 3 is set, will override protection,
0000       ;                i.e., go ahead and write on tape.  If run APT & event flag 3
0000       ;                is clear & tape is not scratch, will report an error.
0000       ;                Modified Unibus sizer on Test 8 & 9. make test run faster.
0000       ;
0000       ;
0000       ;                Tai-Chun Pan    03-Aug-83        Version 1.3
0000       ;
0000       ;                fixed bugs on TEST 7 and error summary routine call when
0000       ;                running under APT.
0000       ;
0000       ;
```

```
                 0000     58 ;
                 0000     59 ;--
```

```
              0000     61          .SBTTL  DECLARATIONS
              0000     62          .LIST   MEB
              0000     63          .NLIST  CND
          00000000     64          .PSECT  ENKAX1, PAGE, NOWRT
              0000     65          .LIBRARY        "SYS$LIBRARY:DIAG"             ; VAX family diagnostic libr
              0000     66          $DS_BGNMOD      CEP_REPAIR
              0000        ;;;      Macro-32 Diagnostic macro library Version 6.10 'DIAG.MLB (137)"
              0000     67
              0000     68 ;
              0000     69 ; Include files:
              0000     70 ;
              0000     71          .LIBRARY        "ENKAX"                ; CPU Cluster Exerciser library.
              0000     72
              0000     76
              0000     77          $DS_SCBDEF      GLOBAL                 ; Defines system control block
              0000     78          $DS_DSDEF       GLOBAL                 ; Supervisor status, cond. codes
              0000     79          $DS_DSSDEF      GLOBAL                 ; Supervisor service entry points
              0000     80          $DS_DSADEF                             ; Apt command, mailbox offsets
              0000     81          $DS_PARDEF                             ; Define Psl bits
              0000     82          $DS_PSLDEF      GLOBAL                 ; Starlet definition of the Psl
              0000     83          $PRDEF          GLOBAL                 ; Defines processor registers
              0000     84          $DS_CHDEF       GLOBAL                 ;
              0000     85          $CHFDEF                                ;
              0000     86          $DS_HPODEF                             ; Hardware P-table offsets
              0000     87          KA_DEF                                 ; Set up for processor P-table
              0000     88          $DS_QADEF       GLOBAL                 ;
 03003600     0000     89          KA730_REV_54 == ^X 03003600            ; KA730 micro rev ID value
              0000     90
              0000     91 ;
              0000     92 ; Own storage and equated symbols:
              0000     93 ;
              0000     94
 00000348     0000     95 SCB$L_UBE_0             =^X348                 ; UBE 0 interrupt vector offset
 0000034C     0000     96 SCB$L_UBE_1             =^X34C                 ; UBE 1 interrupt vector offset
 00000350     0000     97 SCB$L_UBE_2             =^X350                 ; UBE 2 interrupt vector offset
 00000354     0000     98 SCB$L_UBE_3             =^X354                 ; UBE 3 interrupt vector offset
              0000     99
 02000000     0000    100 M_DSABL_ECC             =1@25                  ; memory CSR disable ECC bit
 00F20004     0000    101 A_MEM_CSR_1             =^XF20004              ; address of memory CSR
              0000    102
 0000000C     0000    103 HP$KA_L_FLAGS           =^XC                   ; offset of flags in p table
 00000044     0000    104 HP$KA_MEM_SIZE          =^X44                  ; offset of memory size in p table
              0000    105
 00000004     0000    106 A_BUFFER_BEGIN::        .BLKL   1              ; address of data buffer
 00000008     0004    107 A_BUFFER_END::          .BLKL   1
 00000010     0008    108 A_PWR_BUFFER::          .BLKL   2              ; address of POWER FAIL data buffer
 00000018     0010    109 A_HALT_BUFFER::         .BLKL   2              ; address of HALTS data buffer
 00000020     0018    110 A_MCHK_BUFFER::         .BLKL   2              ; address of MACHINE CHECK data buffer
 00000028     0020    111 A_WCS_BUFFER::          .BLKL   2              ; address of WCS data buffer
 00000030     0028    112 A_UBE_BUFFER_0::        .BLKL   2              ; address of UBE buffer 0
 00000038     0030    113 A_UBE_BUFFER_1::        .BLKL   2              ; address of UBE buffer 1
 00000040     0038    114 A_UBE_BUFFER_2::        .BLKL   2              ; address of UBE buffer 2
 00000048     0040    115 A_UBE_BUFFER_3::        .BLKL   2              ; address of UBE buffer 3
 00000050     0048    116 A_FREE_MEM::            .BLKL   2              ; address of buffer above supervisor
              0050    117
 00000054     0050    118 L_ACT_SP::              .BLKL                  ; used to store actual SP
 00000058     0054    119 L_ACT_KSP::             .BLKL                  ; used to store actual KSP
```

```
         0000005C  0058   120 L_ACT_ISP::                   .BLKL         ; used to store actual ISP
         00000060  005C   121 L_ACT_PSL::                   .BLKL         ; used to store actual PSL
         00000064  0060   122 L_KSP::                       .BLKL         ; used to store initial KSP
         00000068  0064   123 L_ISP::                       .BLKL         ; used to store initial ISP
                   0068   124
         FFFFFFFF  0068   125 L_LAST_UBE::                  .LONG   -1    ; highest UBE number (0,1,2,or 3)
               00  006C   126 B_TU58_DRIVE::                .BYTE   0     ; represents TU58 drives attached
         00000000  006D   127 A_P_TABLE:                    .LONG         ; address of hardware p table
         00000000  0071   128 KA_UNIT_NO::                  .LONG         ; CPU unit number
         00000000  0075   129 TU0_UNIT_NO::                 .LONG         ; TU58 drive 0 unit number
         00000000  0079   130 TU1_UNIT_NO::                 .LONG         ; TU58 drive 1 unit number
         00000000  007D   131 BE0_UNIT_NO::                 .LONG         ; UBE 0 unit number
         00000000  0081   132 BE1_UNIT_NO::                 .LONG         ; UBE 1 unit number
         00000000  0085   133 BE2_UNIT_NO::                 .LONG         ; UBE 2 unit number
         00000000  0089   134 BE3_UNIT_NO::                 .LONG         ; UBE 3 unit number
         00000000  008D   135 L_KA_FLAGS::                  .LONG         ; KA flags
         00000000  0091   136 L_KSIZE_PTBL::                .LONG         ; memory size from p table (kbytes)
                   0095   137
                   0095   138 GPR_TABLE::
         00000000  0095   139           .LONG   ^X00000000              ; data for register 0
         11111111  0099   140           .LONG   ^X11111111              ; data for register 1
         22222222  009D   141           .LONG   ^X22222222              ; data for register 2
         33333333  00A1   142           .LONG   ^X33333333              ; data for register 3
         44444444  00A5   143           .LONG   ^X44444444              ; data for register 4
         55555555  00A9   144           .LONG   ^X55555555              ; data for register 5
         66666666  00AD   145           .LONG   ^X66666666              ; data for register 6
         77777777  00B1   146           .LONG   ^X77777777              ; data for register 7
         88888888  00B5   147           .LONG   ^X88888888              ; data for register 8
         99999999  00B9   148           .LONG   ^X99999999              ; data for register 9
         AAAAAAAA  00BD   149           .LONG   ^XAAAAAAAA              ; data for register A
         BBBBBBBB  00C1   150           .LONG   ^XBBBBBBBB              ; data for register B
         000000C9  00C5   151 L_EXP_AP::        .BLKL           ; location to store argument counter
         000000CD  00C9   152 L_EXP_FP::        .BLKL           ; location to store frame pointer
         000000D1  00CD   153 L_EXP_SP::        .BLKL           ; location to store expected SP
         000000D5  00D1   154 L_EXP_KSP::       .BLKL           ; location to store expected KSP
         000000D9  00D5   155 L_EXP_ISP::       .BLKL           ; location to store expected ISP
         000000DD  00D9   156 L_EXP_PSL::       .BLKL           ; location to store expected PSL
                   00DD   157
                   00DD   158
                   00DD   159
                   00DD   160 REG_TABLE::
      20 30 52 00' 00DD   161           .ASCIC  'R0 '
               03  00DD
      20 31 52 00' 00E1   162           .ASCIC  'R1 '
               03  00E1
      20 32 52 00' 00E5   163           .ASCIC  'R2 '
               03  00E5
      20 33 52 00' 00E9   164           .ASCIC  'R3 '
               03  00E9
      20 34 52 00' 00ED   165           .ASCIC  'R4 '
               03  00ED
      20 35 52 00' 00F1   166           .ASCIC  'R5 '
               03  00F1
      20 36 52 00' 00F5   167           .ASCIC  'R6 '
               03  00F5
      20 37 52 00' 00F9   168           .ASCIC  'R7 '
               03  00F9
```

```
                        20 38 52 00' 00FD    169         .ASCIC  "R8 "
                                 03  00FD
                        20 39 52 00' 0101    170         .ASCIC  "R9 "
                                 03  0101
                        30 31 52 00' 0105    171         .ASCIC  "R10"
                                 03  0105
                        31 31 52 00' 0109    172         .ASCIC  "R11"
                                 03  0109
                        20 50 41 00' 010D    173         .ASCIC  "AP "
                                 03  010D
                        20 50 46 00' 0111    174         .ASCIC  "FP "
                                 03  0111
                                     0115    175
                                     0115    176
                                     0115    177 ; The following is used tc intrepret the PSL and to print out an English
                                     0115    178 ; language description of its contents.
                                     0115    179
                                     0115    180 A_PSLMNE::
44 50 46 2C 2C 2C 50 54 2C 4D 43 00' 0115    181         .ASCIC  "CM,TP,,,FPD,IS,CUR=2@,PRV=2@,,"-
50 2C 40 32 3D 52 55 43 2C 53 49 2C  0121
35 3D 4C 50 49 2C 2C 40 32 3D 56 52  012D
44 2C 2C 2C 2C 2C 2C 2C 2C 2C 58 5E  0139
2C 4E 2C 54 2C 56 49 2C 55 46 2C 56  0145
                     43 2C 56 2C 5A  0151
                                 40  0115
                                     0156    182                 "IPL=5^X,,,,,,,,,DV,FU,IV,T,N,Z,V,C"
                                     0156    183
                           00000004  0156    184 MODELIST::      .LONG   4
                          0000016A'  015A    185         .ADDRESS        AKM
                          00000171'  015E    186         .ADDRESS        AEM
                          0000017B'  0162    187         .ADDRESS        ASM
                          00000186'  0166    188         .ADDRESS        AUM
                                     016A    189
               4C 45 4E 52 45 4B 00' 016A    190 AKM:    .ASCIC  "KERNEL"
                                 06  016A
      45 56 49 54 55 43 45 58 45 00' 0171    191 AEM:    .ASCIC  "EXECUTIVE"
                                 09  0171
   52 4F 53 49 56 52 45 50 55 53 00' 017B    192 ASM:    .ASCIC  "SUPERVISOR"
                                 0A  017B
                     52 45 53 55 00' 0186    193 AUM:    .ASCIC  "USER"
                                 04  0186
                                     018B    194
                                     018B    195
                                     018B   200         .SBTTL  Program Header Data Block
                                     018B   201 ;++
                                     018B   202 ; Functional Description:
                                     018B   203 ;
                                     018B   204 ;       The program header data block contains the parameters which
                                     018B   205 ;       allow the Diagnostic Supervisor to control the program.
                                     018B   206 ;       The Diagnostic Supervisor looks for the header information
                                     018B   207 ;       beginning at virtual address 200(hex).
                                     018B   208 ;
                                     018B   209 ;--
                                     018B   210         $DS_HEADER  <VAX 11/730 Specific CPU Cluster Exerciser - ZZ-ENKAX-1.3 >, -
                                     018B   211                         REV = 1, UPDATE = 3, -
                                     018B   212                         NUNIT = 7
                                     018B                       .SAVE
                                 00000000                       .PSECT  $HEADER, PAGE, NOEXE, NOWRT
                           00000058' 0000       L$L_HEADLENGTH: .LONG     A_HEADEND-.     ; LENGTH OF THE HEADER DATA BLOCK
                           00000005  0004       L$L_ENVIRON:    .LONG     <ENV$_SUPER@ENV$V_SUPER>+$ENV  ; PROGRAM ENVIRONMENT
                           00000058' 0008       L$A_NAME:       .ADDRESS T_NAME          ; PROGRAM NAME TEXT ADDRESS
                           00000001  000C       L$L_REV:        .LONG    1               ; PROGRAM REVISION LEVEL
                           00000003  0010       L$L_UPDATE:     .LONG    3               ; DIAGNOSTIC ENGINEERING PATCH ORDER
                           00000000' 0014       L$A_LASTAD:     .ADDRESS LASTAD          ; FIRST FREE LOCATION AFTER PROGRAM
                           00000000' 0018       L$A_DTP:        .ADDRESS DISPATCH        ; TEST DISPATCH TABLE POINTER
                           0000009B' 001C       L$A_DEVP:       .ADDRESS AL_DEVTYP       ; DEVICE TYPE LIST POINTER
                           00000007  0020       L$L_UNIT:       .LONG    7               ; NUMBER OF UNITS THAT CAN BE TESTED
                           00000000' 0024       L$A_DREG:       .ADDRESS DEV_REG         ; DEVICE REGISTER CONTENTS TABLE POINTER
                           0000001C  0028                       .LONG    28              ; Ptable length for 4.05 compatability
00000000'00000000'00000000'00000000' 002C                       .LONG    0[4]            ; UNUSED OFFSETS
                           00000000' 003C       L$A_ICP:        .ADDRESS INITIALIZE      ; INITIALIZATION CODE POINTER
                           00000000' 0040       L$A_CCP:        .ADDRESS CLEAN_UP        ; CLEAN-UP CODE POINTER
                           00000000' 0044       L$A_REPP:       .ADDRESS SUMMARY         ; SUMMARY REPORT CODE POINTER
                           00000000' 0048       L$A_STATAB:     .ADDRESS 0               ; STATISTIC TABLE POINTER
                           00000000  004C       L$L_ERRTYP:     .LONG    0               ; # OF TYPES OF $ERRSOFT & $ERRPREP
                           00000057' 0050       L$A_SECNAM:     .ADDRESS SECTION         ; LIST OF SECTION NAME ADDRESSES
                           00000000' 0054       L$A_TSTCNT:     .ADDRESS L_TSTCNT        ; POINTER TO NUMBER OF TESTS
                                     0058       A_HEADEND:
20 30 33 37 2F 31 31 20 58 41 56 00' 0058       T_NAME:         .ASCIC  \VAX 11/730 Specific CPU Cluster Exerciser - ZZ-ENKAX-1.3 \
55 50 43 20 63 69 66 69 63 65 70 53  0064
65 78 45 20 72 65 74 73 75 6C 43 20  0070
2D 5A 5A 20 2D 20 72 65 73 69 63 72  007C
      20 33 2E 31 2D 58 41 4B 4E 45  0088
                                 39  0058
                                 00000000                       .PSECT  _LAST, PAGE
                                     0000       LASTAD:
                                 00000000                       .PSECT  $TSTCNT, NOEXE, NOWRT, OVR, LONG
                                     0000       L_TSTCNT:
                                 0000018B                       .RESTORE
```

```
                                     018B   214          .SBTTL  Dispatch Table
                                     018B   215 ;++
                                     018B   216 ; Functional Description:
                                     018B   217 ;
                                     018B   218 ;        The Dispatch Table is a collection of addresses generated at the
                                     018B   219 ;        beginning of each test and grouped together into a contiguous
                                     018B   220 ;        list by the linker.  This is done by defining a PSECT called
                                     018B   221 ;        DSIPATCH.
                                     018B   222 ;
                                     018B   223 ;--
                                     018B   224
                                     018B   225          $DS_DISPATCH
                                     018B                    .SAVE
                                 00000000                    .PSECT  DISPATCH, LONG, NOWRT, NOEXE
                                     0000        DISPATCH:
                                 00000000                    .PSECT  DISPATCH_X, LONG, NOWRT, NOEXE
00000000'00000000'00000000'00000000' 0000                    .LONG   0[6]
                  00000000'00000000' 0010
                                 0000018B                    .RESTORE
                                     018B   226
                                     018B   227          .SBTTL  Hardware Parameter Table
                                     018B   228 ;++
                                     018B   229 ;
                                     018B   230 ;        The hardware parameter table holds all of the hardware related
                                     018B   231 ;        parameters which can be modified by the operator at run time.
                                     018B   232 ;        The Diagnostic Supervisor maintains a seperate copy of the
                                     018B   233 ;        hardware parameter table for each unit under test.
                                     018B   234 ;        The hardware parameter code section is used to actually supply
                                     018B   235 ;        the values to these locations.
                                     018B   236 ;--
                                     018B   237
                           0000018F  018B   238 KA_PTABLE::       .BLKL   1               ; pointer to the CPU parameter table.
                                     018F   239
```

```
                             018F   241           .SBTTL  Program Global Data Section
                             018F   242  ;++
                             018F   243  ;
                             018F   244  ; General data used by more than one module.
                             018F   245  ;
                             018F   246  ;--
                             018F   247           .SAVE
                         00000000   248           .PSECT  DATA,PAGE
                             0000   249
                             0000   250  DEV_REG:
                             0000   251
                             0000   252  ;
                             0000   253  ;        Miscellaneous data
                             0000   254  ;
                             0000   255
                 00000000    0000   256  HARDCNT::       .LONG   0                  ; Exerciser summary hard
                             0004   257                                            ;  error count.
                 0000000C    0004   258  Q_TEST_TIME:    .BLKQ   1                  ; Test start time, used to calculate
                             000C   259                                            ;  test run time for summary report.
                             000C   260
                             000C   261
                             000C   262  ;+
                             000C   263  ; Test summary information data block
                             000C   264  ;
                             000C   265  ;        The test summary information block is dynamically allocated, based
                             000C   266  ;        on the number of tests in the program.  There is one entry per test
                             000C   267  ;        which contains all the pertinent error and run time information.
                             000C   268  ;        This information is displayed by the SUMMARY procedure, which is
                             000C   269  ;        invoked at the end of a program run or by an operator 'SUMMARY'
                             000C   270  ;        command.
                             000C   271  ;
                             000C   272  ;--
                             000C   273
                 00000014    000C   274  SUM_A_BLOCK:    .BLKL   2                  ; Two longword array to receive the
                             0014   275                                            ;  start and end addresses of the
                             0014   276                                            ;  summary information data block.
                             0014   277           .SAVE
                             0014   278           .PSECT  $ABS$
                 00000000    0610   279           . = 0
                             0000   280  $DEF     SUM_L_HARDCNT, .BLKL, 1           ; Hard error count entry displacement.
                             0000             .IIF    NB,SUM_L_HARDCNT,             SUM_L_HARDCNT::
                 00000004    0000             .IIF    NB,.BLKL,         .BLKL       1
                             0004   281  $DEF     SUM_Q_RUNTIME, .BLKQ, 1           ; Run time entry displacement.
                             0004             .IIF    NB,SUM_Q_RUNTIME,             SUM_Q_RUNTIME::
                 0000000C    0004             .IIF    NB,.BLKQ,         .BLKQ       1
                             000C   282  $DEF     SUM_K_SIZE                        ; Size of summary information block
                             000C             .IIF    NB,SUM_K_SIZE,  SUM_K_SIZE::
                             000C   283                                            ;  for one test.
                         00000014   284           .RESTORE
                             0014   285
                 00000018    0014   286  SUM_BLK_SIZE:   .BLKL   1                  ; Number of pages for summary info block.
```

```
                              0018  288          .SBTTL  Program Text Section
                              0018  289 ;++
                              0018  290 ;
                              0018  291 ;        This section contains all the common character string type data
                              0018  292 ;        entries.
                              0018  293 ;
                              0018  294 ;--
                              0018  295
                              0018  296 ;+
                              0018  297 ; Program section names:
                              0018  298 ;                             MANUAL,TU58,POWER,HALT,MCHK,IPR,WCS,ALL,MEM,UBI,
                              0018  299 ;                             LDPCTX
                              0018  300 ;-
                              0018  301
                              0018  302          $DS_SECTION     MANUAL,TU58,POWER,HALT,MCHK,IPR,WCS,ALL,MEM,UBI,-
                              0018  303                          LDPCTX
                              0018      S_DEFAULT:
      54 4C 55 41 46 45 44 00' 0018                    .ASCIC  \DEFAULT\
                           07  0018
                              0020      S_MANUAL:
         4C 41 55 4E 41 4D 00' 0020                    .ASCIC  \MANUAL\
                           06  0020
                              0027      S_TU58:
               38 35 55 54 00' 0027                    .ASCIC  \TU58\
                           04  0027
                              002C      S_POWER:
            52 45 57 4F 50 00' 002C                    .ASCIC  \POWER\
                           05  002C
                              0032      S_HALT:
               54 4C 41 48 00' 0032                    .ASCIC  \HALT\
                           04  0032
                              0037      S_MCHK:
               4B 48 43 4D 00' 0037                    .ASCIC  \MCHK\
                           04  0037
                              003C      S_IPR:
                  52 50 49 00' 003C                    .ASCIC  \IPR\
                           03  003C
                              0040      S_WCS:
                  53 43 57 00' 0040                    .ASCIC  \WCS\
                           03  0040
                              0044      S_ALL:
                  4C 4C 41 00' 0044                    .ASCIC  \ALL\
                           03  0044
                              0048      S_MEM:
                  4D 45 4D 00' 0048                    .ASCIC  \MEM\
                           03  0048
                              004C      S_UBI:
                  49 42 55 00' 004C                    .ASCIC  \UBI\
                           03  004C
                              0050      S_LDPCTX:
         58 54 43 50 44 4C 00' 0050                    .ASCIC  \LDPCTX\
                           06  0050
                              0057      SECTION:
                    0000000C  0057                    .LONG   12
                    00000018' 005B                    .LONG   S_DEFAULT
                    00000020' 005F                    .LONG   S_MANUAL
                    00000027' 0063                    .LONG   S_TU58
```

```
                         0000002C' 0067                            .LONG   S_POWER
                         00000032' 006B                            .LONG   S_HALT
                         00000037' 006F                            .LONG   S_MCHK
                         0000003C' 0073                            .LONG   S_IPR
                         00000040' 0077                            .LONG   S_WCS
                         00000044' 007B                            .LONG   S_ALL
                         00000048' 007F                            .LONG   S_MEM
                         0000004C' 0083                            .LONG   S_UBI
                         00000050' 0087                            .LONG   S_LDPCTX
                                   008B    304
                                   008B    305
                                   008B    306 ;+
                                   008B    307 ; Device mnemonics list:
                                   008B    308 ;        KA730 = VAX-11/730 CPU
                                   008B    309 ;-
                                   008B    310
                                   008B    311         $DS_DEVTYP              <KA730,TU58,UBE>
                 30 33 37 41 4B 00' 008B       T_KA730:                        .ASCIC  \KA730\
                                05 008B
                    38 35 55 54 00' 0091       T_TU58:             .ASCIC  \TU58\
                                04 0091
                       45 42 55 00' 0096       T_UBE:              .ASCIC  \UBE\
                                03 0096
                                00 009A            .BYTE   0
                         00000003  009B       AL_DEVTYP:           .LONG   $$N
                         0000008B' 009F                            .LONG   T_KA730
                         00000091' 00A3                            .LONG   T_TU58
                         00000096' 00A7                            .LONG   T_UBE
                                   00AB    312
                                   00AB    313 ;+
                                   00AB    314 ; ASCII buffers
                                   00AB    315 ;-
                         0000000B  00AB    316 BUF_SIZE = 11
                                   00AB    317 QWD_TIME:
                        0000 000B  00AB    318         .WORD   BUF_SIZE, 0
                         000000B3' 00AF    319         .LONG   T_TIME
                                   00B3    320
                         000000BE  00B3    321 T_TIME: .BLKB   BUF_SIZE
                                   00BE    322
                                   00BE    323
                                   00BE    324 ;+
                                   00BE    325 ; Formatted ASCII output statements
                                   00BE    326 ;-
                                   00BE    327
                                   00BE    328 FMT_SUMMARY:                     ; FAO message for module summary printout.
20 57 5A 21 20 74 73 65 54 2F 21 00' 00BE    329         .ASCIC  "'!/Test !ZW had !ZL hard error!%s, !AS run time.''
64 72 61 68 20 4C 5A 21 20 64 61 68  00CA
21 20 2C 73 25 21 72 6F 72 72 65 20  00D6
2E 65 6D 69 74 20 6E 75 72 20 53 41  00E2
                                 2F  00BE
                                     00EE    330
2A 2A 2A 2A 2A 2A 2A 2A 2A 2A 2A 00' 00EE    331 MM_MSG: .ASCIC  '*********** UNABLE TO SHUT OFF MEMORY MANAGEMENT ***********'
53 20 4F 54 20 45 4C 42 41 4E 55 20  00FA
4F 4D 45 4D 20 46 46 4F 20 54 55 48  0106
4E 45 4D 45 47 41 4E 41 4D 20 59 52  0112
2A 2A 2A 2A 2A 2A 2A 2A 2A 2A 20 54  011E
                                 2A  012A
```

```
                          3C  00EE
                              012B    332 ; [01]
                              012B    333
```

```
012B            .SBTTL  Initialization Procedure
012B    ;++
012B    ; Functional description:
012B    ;
012B    ;       This routine will be executed at the beginning of each pass.
012B    ;       This section is responsible for control of:
012B    ;
012B    ;       A) a double iteration of the exerciser to make up 1 pass;
012B    ;       B) test summary information block initialization.
012B    ;
012B    ; Calling sequence:
012B    ;
012B    ;       The Diagnostic Supervisor automatically invokes this routine with
012B    ;       a procedure call instruction.
012B    ;
012B    ; Input parameters:
012B    ;
012B    ;       INTERS_FLAG = 0 representing 1st iteration of a double iteration
012B    ;               of the dispatch table to make up 1 pass.
012B    ;
012B    ; Implicit inputs:      None
012B    ;
012B    ; Output parameters:    None
012B    ;
012B    ; Implicit outputs:     None
012B    ;
012B    ; Completion codes:     None
012B    ;
012B    ; Side effects:         None
012B    ;
012B    ;--
```

```
                                     012B  367       $DS_BGNINIT
                                     012B                    .SAVE
                                 00000000                    .PSECT INITIALIZE,LONG
                                     0000      INITIALIZE:
                                0000 0000                    .WORD  ^M<>            ; ENTRY MASK
                     00000000'EF  D4 0002  368       CLRL           HARDCNT                ; Initialize the test summary
                                     0008  369                                             ;  hard errors counter.
                                     0008  370       $DS_BPASS0     0$
                              1D  E0 0008                    BBS    #DSA$V_PASS0,-  ; BR IF PASS 0
                  03 0000FE00 9F     000A                           @#DSA$GL_FLAGS, 0$
                            0248  31 0010  371       BRW            2000$                 ; br = not Pass 0
                                     0013  372
                                     0013  373 0$:   $DS_MMOFF_G                    ; Turn memory management off [01]
                00010158 9F   6E  FA 0013                    CALLG  (SP), @#DS$MMOFF
                           14 50  E8 001A  374       BLBS           R0,2$           ; If operator has turned it on [01]
                                     001D  375       $DS_PRINTF_S   FORMAT=MM_MSG   ; then program is unable to turn [01]
                     000000EE'EF  9F 001D                    PUSHAB MM_MSG
                000100F0 9F   01  FB 0023                    CALLS  #$$N, @#DS$PRINTF
                                     002A  376       $DS_ABORT      PROGRAM         ; it off , hence abort program [01]
                00010020 9F   6C  FA 002A                    CALLG  (AP), @#DS$ABORT
                                     0031  377
      0000007D'EF    FFFFFFFF 8F  D0 0031  378 2$:   MOVL           #-1,BE0_UNIT_NO       ; load default value
      00000081'EF    FFFFFFFF 8F  D0 003C  379       MOVL           #-1,BE1_UNIT_NO       ; load default value
      00000085'EF    FFFFFFFF 8F  D0 0047  380       MOVL           #-1,BE2_UNIT_NO       ; load default value
      00000089'EF    FFFFFFFF 8F  D0 0052  381       MOVL           #-1,BE3_UNIT_NO       ; load default value
      0000018B'EF    FFFFFFFF 8F  D0 005D  382       MOVL           #-1,KA_PTABLE         ; load default value
      00000068'EF    FFFFFFFF 8F  D0 0068  383       MOVL           #-1,L_LAST_UBE        ; load default value
                     0000006C'EF  94 0073  384       CLRB           B_TU58_DRIVE          ; clear drive flags
                              54  D4 0079  385       CLRL           R4                    ; clear unit number
                                     007B  386 10$:  $DS_GPHARD_S   R4,A_P_TABLE          ; get p table address
                     0000006D'EF  DF 007B                    PUSHAL A_P_TABLE
                              54  DD 0081                    PUSHL  R4
                00010018 9F   02  FB 0083                    CALLS  #2, @#DS$GPHARD
                                     008A  387       $DS_BNERROR    15$                   ; br = p tables not exhausted
                              50  DD 008A                    PUSHL  R0
                              01  DD 008C                    PUSHL  #$ER
                              27  DD 008E                    PUSHL  #DS$K_BNERROR
                000100A8 9F   03  FB 0090                    CALLS  #3, @#DS$BRANCH
                           03 50  E8 0097                    BLBS   R0, 15$
                            00CD  31 009A  388       BRW            170$                  ; br = p tables exhausted
                55   0000006D'EF  D0 009D  389 15$:  MOVL           A_P_TABLE,R5          ; load p table address
             00000096'EF   26 A5  D1 00A4  390       CMPL           HP$T_TYPE(R5),T_UBE   ; UBE?
                              3B  12 00AC  391       BNEQ           70$                   ; br = not UBE
                     00000068'EF  D6 00AE  392       INCL           L_LAST_UBE            ; count UBE
               03    00    0B A5  8F 00B4  393       CASEB          HP$B_DRIVE(R5),#0,#3  ; br for UBE number
                               0008' 00B9  394 20$:                 .WORD   30$-20$       ; if UBE 0
                               0012' 00BB  395                      .WORD   40$-20$       ; if UBE 1
                               001C' 00BD  396                      .WORD   50$-20$       ; if UBE 2
                               0026' 00BF  397                      .WORD   60$-20$       ; if UBE 3
                0000007D'EF   54  D0 00C1  398 30$:  MOVL           R4,BE0_UNIT_NO        ; save unit number
                            009A  31 00C8  399       BRW            120$
                00000081'EF   54  D0 00CB  400 40$:  MOVL           R4,BE1_UNIT_NO        ; save unit number
                            0090  31 00D2  401       BRW            120$
                00000085'EF   54  D0 00D5  402 50$:  MOVL           R4,BE2_UNIT_NO        ; save unit number
                            0086  31 00DC  403       BRW            120$
                00000089'EF   54  D0 00DF  404 60$:  MOVL           R4,BE3_UNIT_NO        ; save unit number
                            007C  31 00E6  405       BRW            120$                  ; br to end of loop
```

```
         0000008B'EF    26 A5   D1  00E9   406 70$:    CMPL           HP$T_TYPE(R5),T_KA730    ; KA730?
                           2F   12  00F1   407         BNEQ           80$                      ; br = not KA730
         0000008F'9F    2A A5   B1  00F3   408         CMPW           <HP$T_TYPE+4>(R5),@#<T_KA730+4> ; KA730?
                           25   12  00FB   409         BNEQ           80$                      ; br = not KA730
           00000071'EF     54   D0  00FD   410         MOVL           R4,KA_UNIT_NO            ; save CPU unit number
   0000018B'EF    0000006D'EF   D0  0104   411         MOVL           A_P_TABLE,KA_PTABLE      ; load KA730 p table address
         0000008D'EF    0C A5   D0  010F   412         MOVL           HP$KA_L_FLAGS(R5),L_KA_FLAGS ; save ka flags
         00000091'EF    44 A5   D0  0117   413         MOVL           HP$KA_MEM_SIZE(R5),L_KSIZE_PTBL ; save memory size
                         0043   31  011F   414         BRW            120$
         00000091'EF    26 A5   D1  0122   415 80$:    CMPL           HP$T_TYPE(R5),T_TU58     ; TU58?
                           39   12  012A   416         BNEQ           120$                     ; br = not TU58
         00000095'9F    2A A5   91  012C   417         CMPB           <HP$T_TYPE+4>(R5),@#<T_TU58+4> ; TU58?
                           2F   12  0134   418         BNEQ           120$                     ; br = not TU58
            55    0000006D'EF   D0  0136   419         MOVL           A_P_TABLE,R5             ; load p table address
             01     00    0B A5   8F  013D   420         CASEB          HP$B_DRIVE(R5),#0,#1     ; which drive?
                         0004'  0142   421 90$:                   .WORD   100$-90$         ; if drive 0
                         0015'  0144   422                        .WORD   110$-90$         ; if drive 1
           0000006C'EF     01   C8  0146   423 100$:   BISL2          #1,B_TU58_DRIVE          ; set bit for drive 0
           00000075'EF     54   D0  014D   424         MOVL           R4,TU0_UNIT_NO           ; save drive 0 unit number
                         000E   31  0154   425         BRW            120$                     ; br to end of loop
           00000079'EF     54   D0  0157   426 110$:   MOVL           R4,TU1_UNIT_NO           ; save drive 1 unit number
           0000006C'EF     02   C8  015E   427         BISL2          #2,B_TU58_DRIVE          ; set bit for drive 1
                           54   D6  0165   428 120$:   INCL           R4                       ; incr unit number   .
                         FF11   31  0167   429         BRW            10$                      ; br to beginning of loop
             0000012B'EF   16   016A   430 170$:   JSB     SUMMARY_INIT                    ; Structure module summary
                                0170   431                                                 ; Information block
                           55   D4  0170   432         CLRL    R5                              ; Clear count
                                0172   433                                                 ; Look for free memory above
                                0172   434 300$:   $DS_GETBUF_S    PAGCNT=#1, RETADR=A_FREE_MEM           ; supervisor
                           00   DD  0172                           PUSHL   #0
                           00   DD  0174                           PUSHL   #0
             00000048'EF   7F   0176                               PUSHAQ  A_FREE_MEM
                           01   DD  017C                           PUSHL   #1
          00010120 9F      04   FB  017E                           CALLS   #4, @#DS$GETBUF
                                0185   435         $DS_BNCOMPLETE  500$                            ; br = unsuccessful
                        11 50   E9  0185                           BLBC    R0, 500$
                           55   D6  0188   436         INCL    R5                              ; count buffers allocated
   00020000 8F    00000048'EF   D1  018A   437         CMPL    A_FREE_MEM,#^X20000             ; beyond 1st 128k ?
                           DB   19  0195   438         BLSS    300$                            ; br = not beyond 1st 128k
                           06   11  0197   439         BRB     900$                            ; br = successful
             00000048'EF   7C   0199   440 500$:   CLRQ    A_FREE_MEM                      ; clear buffer address
                                019F   441
                                019F   442 900$:   $DS_RELBUF_S    PAGCNT=#1                       ; release buffers
                           00   DD  019F                           PUSHL   #0
                           00   DD  01A1                           PUSHL   #0
                           01   DD  01A3                           PUSHL   #1
          00010128 9F      03   FB  01A5                           CALLS   #3, @#DS$RELBUF
                           55   D7  01AC   443         DECL    R5                              ; count page
                           EF   12  01AE   444         BNEQ    900$           —                ; br = not done
                                01B0   445
                                01B0   446         $DS_GETBUF_S    PAGCNT=#3, RETADR=A_BUFFER_BEGIN
                           00   DD  01B0                           PUSHL   #0
                           00   DD  01B2                           PUSHL   #0
             00000000'EF   7F   01B4                               PUSHAQ  A_BUFFER_BEGIN
                           03   DD  01BA                           PUSHL   #3
          00010120 9F      04   FB  01BC                           CALLS   #4, @#DS$GETBUF
                                01C3   447         $DS_GETBUF_S    PAGCNT=#1, RETADR=A_PWR_BUFFER
```

```
               00   DD  01C3                         PUSHL   #0
               00   DD  01C5                         PUSHL   #0
      00000008'EF   7F  01C7                         PUSHAQ  A_PWR_BUFFER
               01   DD  01CD                         PUSHL   #1
00010120 9F    04   FB  01CF                         CALLS   #4, @#DS$GETBUF
                        01D6    448         $DS_GETBUF_S     PAGCNT=#1, RETADR=A_HALT_BUFFER
               00   DD  01D6                         PUSHL   #0
               00   DD  01D8                         PUSHL   #0
      00000010'EF   7F  01DA                         PUSHAQ  A_HALT_BUFFER
               01   DD  01E0                         PUSHL   #1
00010120 9F    04   FB  01E2                         CALLS   #4, @#DS$GETBUF
                        01E9    449         $DS_GETBUF_S     PAGCNT=#1, RETADR=A_MCHK_BUFFER
               00   DD  01E9                         PUSHL   #0
               00   DD  01EB                         PUSHL   #0
      00000018'EF   7F  01ED                         PUSHAQ  A_MCHK_BUFFER
               01   DD  01F3                         PUSHL   #1
00010120 9F    04   FB  01F5                         CALLS   #4, @#DS$GETBUF
                        01FC    450         $DS_GETBUF_S     PAGCNT=#10, RETADR=A_WCS_BUFFER
               00   DD  01FC                         PUSHL   #0
               00   DD  01FE                         PUSHL   #0
      00000020'EF   7F  0200                         PUSHAQ  A_WCS_BUFFER
               0A   DD  0206                         PUSHL   #10
00010120 9F    04   FB  0208                         CALLS   #4, @#DS$GETBUF
                        020F    451         $DS_GETBUF_S     PAGCNT=#8, RETADR=A_UBE_BUFFER_0
               00   DD  020F                         PUSHL   #0
               00   DD  0211                         PUSHL   #0
      00000028'EF   7F  0213                         PUSHAQ  A_UBE_BUFFER_0
               08   DD  0219                         PUSHL   #8
00010120 9F    04   FB  021B                         CALLS   #4, @#DS$GETBUF
                        0222    452         $DS_GETBUF_S     PAGCNT=#8, RETADR=A_UBE_BUFFER_1
               00   DD  0222                         PUSHL   #0
               00   DD  0224                         PUSHL   #0
      00000030'EF   7F  0226                         PUSHAQ  A_UBE_BUFFER_1
               08   DD  022C                         PUSHL   #8
00010120 9F    04   FB  022E                         CALLS   #4, @#DS$GETBUF
                        0235    453         $DS_GETBUF_S     PAGCNT=#8, RETADR=A_UBE_BUFFER_2
               00   DD  0235                         PUSHL   #0
               00   DD  0237                         PUSHL   #0
      00000038'EF   7F  0239                         PUSHAQ  A_UBE_BUFFER_2
               08   DD  023F                         PUSHL   #8
00010120 9F    04   FB  0241                         CALLS   #4, @#DS$GETBUF
                        0248    454         $DS_GETBUF_S     PAGCNT=#12, RETADR=A_UBE_BUFFER_3
               00   DD  0248                         PUSHL   #0
               00   DD  024A                         PUSHL   #0
      00000040'EF   7F  024C                         PUSHAQ  A_UBE_BUFFER_3
               0C   DD  0252                         PUSHL   #12
00010120 9F    04   FB  0254                         CALLS   #4, @#DS$GETBUF
                        025B    455 2000$:
                        025B    456
                        025B    457         $DS_ENDPASS_G
00010010 9F    6E   FA  025B                         CALLG   (SP), @#DS$ENDPASS
                        0262    458         $DS_ENDINIT
                        0262        INITIALIZE_X:
00010058 9F    6E   FA  0262                         CALLG   (SP), @#DS$BREAK
                    04  0269                         RET                         ; RETURN TO DIAGNOSTIC SUPERVISOR
                        0000012B                     .RESTORE
```

```
                                012B   460          .SBTTL  Clean-up Procedure
                                012B   461  ;++
                                012B   462  ; Functional description:
                                012B   463  ;
                                012B   464  ;       This routine is executed at the completion of a program run.
                                012B   465  ;       This section is responsible for:
                                012B   466  ;
                                012B   467  ;       A) reinitialization of flags controlling double iteration per pass;
                                012B   468  ;       B) activation of a statistical summary report ($DS_SUMMARY_G);
                                012B   469  ;       C) releasing all temporary buffers.
                                012B   470  ;
                                012B   471  ; Calling sequence:
                                012B   472  ;
                                012B   473  ;       The Diagnostic Supervisor automatically invokes this routine with
                                012B   474  ;       a procedure call instruction.
                                012B   475  ;
                                012B   476  ; Input parameters:     None
                                012B   477  ;
                                012B   478  ; Implicit inputs:
                                012B   479  ;
                                012B   480  ;       The summary information block to be invoked by the $DS_SUMMARY_G
                                012B   481  ;       call has been dynamically filled at run time.
                                012B   482  ;
                                012B   483  ; Output parameters:    None
                                012B   484  ;
                                012B   485  ; Implicit outputs:     None
                                012B   486  ;
                                012B   487  ; Completion codes:     None
                                012B   488  ;
                                012B   489  ; Side effects:
                                012B   490  ;
                                012B   491  ;       The test summary information is destroyed after it is reported.
                                012B   492  ;
                                012B   493  ;--
                                012B   494
                                012B   495          $DS_BGNCLEAN
                                012B                    .SAVE
                            00000000                    .PSECT  CLEANUP,LONG
                                0000          CLEAN_UP:
                          0000  0000                    .WORD   ^M<>            ; ENTRY MASK
                                0002   496          $DS_CLRVEC_S    VECTOR=#SCB$L_TIMER
          000000C0 8F     DD    0002                    PUSHL   #SCB$L_TIMER
       00010168 9F    01  FB    0008                    CALLS   #1, @#DS$CLRVEC
                                000F   497          $DS_CLRVEC_S    VECTOR=#SCB$L_POWER
                   0C     DD    000F                    PUSHL   #SCB$L_POWER
       00010168 9F    01  FB    0011                    CALLS   #1, @#DS$CLRVEC
                                0018   498          $DS_CLRVEC_S    VECTOR=#SCB$L_CHME
          00000044 8F     DD    0018                    PUSHL   #SCB$L_CHME
       00010168 9F    01  FB    001E                    CALLS   #1, @#DS$CLRVEC
                                0025   499          $DS_CLRVEC_S    VECTOR=#SCB$L_CHMS
          00000048 8F     DD    0025                    PUSHL   #SCB$L_CHMS
       00010168 9F    01  FB    002B                    CALLS   #1, @#DS$CLRVEC
                                0032   500          $DS_CLRVEC_S    VECTOR=#SCB$L_CHMU
          0000004C 8F     DD    0032                    PUSHL   #SCB$L_CHMU
       00010168 9F    01  FB    0038                    CALLS   #1, @#DS$CLRVEC
                                003F   501          $DS_CLRVEC_S    VECTOR=#SCB$L_CHMK
          00000040 8F     DD    003F                    PUSHL   #SCB$L_CHMK
```

```
        00010168 9F    01   FB  0045                      CALLS     #1, @#DS$CLRVEC
                                004C   502       $DS_CLRVEC_S      VECTOR=#SCB$L_MACHCHK
                       04   DD  004C                      PUSHL     #SCB$L_MACHCHK
        00010168 9F    01   FB  004E                      CALLS     #1, @#DS$CLRVEC
                                0055   503       $DS_CLRVEC_S      VECTOR=#SCB$L_OPCCUS
                       14   DD  0055                      PUSHL     #SCB$L_OPCCUS
        00010168 9F    01   FB  0057                      CALLS     #1, @#DS$CLRVEC
                                005E   504       $DS_CLRVEC_S      VECTOR=#SCB$L_OPCDEC
                       10   DD  005E                      PUSHL     #SCB$L_OPCDEC
        00010168 9F    01   FB  0060                      CALLS     #1, @#DS$CLRVEC
                                0067   505       $DS_CLRVEC_S      VECTOR=#SCB$L_UBE_0
           00000348 8F      DD  0067                      PUSHL     #SCB$L_UBE_0
        00010168 9F    01   FB  006D                      CALLS     #1, @#DS$CLRVEC
                                0074   506       $DS_CLRVEC_S      VECTOR=#SCB$L_UBE_1
           0000034C 8F      DD  0074                      PUSHL     #SCB$L_UBE_1
        00010168 9F    01   FB  007A                      CALLS     #1, @#DS$CLRVEC
                                0081   507       $DS_CLRVEC_S      VECTOR=#SCB$L_UBE_2
           00000350 8F      DD  0081                      PUSHL     #SCB$L_UBE_2
        00010168 9F    01   FB  0087                      CALLS     #1, @#DS$CLRVEC
                                008E   508       $DS_CLRVEC_S      VECTOR=#SCB$L_UBE_3
           00000354 8F      DD  008E                      PUSHL     #SCB$L_UBE_3
        00010168 9F    01   FB  0094                      CALLS     #1, @#DS$CLRVEC
                                009B   509       $DS_MMOFF_G                           ; Turn memory management off
        00010158 9F    6E   FA  009B                      CALLG     (SP), @#DS$MMOFF
                    07 50   E8  00A2   510       BLBS     R0,2$                        ; If operator has turned it on [01]
                                00A5   511       $DS_ABORT         PROGRAM             ; it off , hence abort program [01]
        00010020 9F    6C   FA  00A5                      CALLG     (AP), @#DS$ABORT
                                00AC   512 2$:   $DS_INITSCB_G
        00010170 9F    6E   FA  00AC                      CALLG     (SP), @#DS$INITSCB
                                00B3   513 ;     $DS_SUMMARY_G
                                00B3   514       $DS_RELBUF_S      PAGCNT=#52          ; release all data buffers
                       00   DD  00B3                      PUSHL     #0
                       00   DD  00B5                      PUSHL     #0
                       34   DD  00B7                      PUSHL     #52
        00010128 9F    03   FB  00B9                      CALLS     #3, @#DS$RELBUF
                                00C0   515       $DS_RELBUF_S      SUM_BLK_SIZE        ; Release summary data block.
                       00   DD  00C0                      PUSHL     #0
                       00   DD  00C2                      PUSHL     #0
           00000014'EF      DD  00C4                      PUSHL     SUM_BLK_SIZE
        00010128 9F    03   FB  00CA                      CALLS     #3, @#DS$RELBUF
                  1C   00   DA  00D1   516       MTPR     #0,#PR$_CSRS                 ; disable TU58 interrupt
                  1E   00   DA  00D4   517       MTPR     #0,#PR$_CSTS                 ; disable TU58 interrupt
                                00D7   518       $DS_SETIPL_S      LEVEL=#0            ; set interrupt level
                       00   DD  00D7                      PUSHL     #0
        00010178 9F    01   FB  00D9                      CALLS     #1, @#DS$SETIPL
 00F20004'EF   02000000 8F  CA  00E0   519       BICL2    #M_DSABL_ECC,A_MEM_CSR_1 ; re-enable memory ECC
                                00EB   520       $DS_ENDCLEAN
                                00EB         CLEAN_UP_X:
        00010058 9F    6E   FA  00EB                      CALLG     (SP), @#DS$BREAK
                            04  00F2                      RET                           ; RETURN TO DIAGNOSTIC SUPERVISOR
                          0000012B                        .RESTORE
```

```
012B          .SBTTL  Summary Report Procedure
012B    ;++
012B    ; Functional description:
012B    ;
012B    ;       This routine issues a summary report upon completion of a run or
012B    ;       upon request from the operator.
012B    ;       Information is taken from the 'head' of the test summary
012B    ;       queue (SUMMARY_INFO) and printed out in the format shown
012B    ;       below under "output parameters:".  The queue is accessed until
012B    ;       empty.
012B    ;
012B    ; Calling sequence:
012B    ;
012B    ;       CALL    SUMMARY
012B    ;
012B    ; Input parameters:     None
012B    ;
012B    ; Implicit inputs:
012B    ;
012B    ;       The test summary information block has been dynamically filled at
012B    ;       run time.
012B    ;
012B    ; Output parameters:
012B    ;
012B    ;       Any tests having errors will have information printed out in the
012B    ;       following format:
012B    ;*
012B    ;       Test xx had yy hard errors; hh:mm:ss run time.
012B    ;
012B    ;       Where,
012B    ;
012B    ;       xx       represents the relevent test number.
012B    ;       yy       represents the accumulated number of hard errors
012B    ;                 encountered in the course of fulfillment of the
012B    ;                 pass requirements.
012B    ;
012B    ;       hh:mm:ss represents the accumulated run time encountered for the
012B    ;                 test in the course of fulfillment of pass requirements.
012B    ;
012B    ;       Note!!!!! any test not encountering errors will not appear
012B    ;       as part of the summary printout (i.e. if no errors existed
012B    ;       in the execution of the exerciser there would be no summary
012B    ;       printout).
012B    ;*
012B    ;
012B    ; Implicit outputs:     None
012B    ;
012B    ; Completion codes:     None
012B    ;
012B    ; Side effects:         None
012B    ;
012B    ;--
```

```
                               012B   575         $DS_BGNSUMMARY  <R2, R3>
                               012B                       .SAVE
                           00000000                       .PSECT  SUMMARY,LONG
                               0000       SUMMARY:
                         000C  0000                       .WORD   ^M<R2, R3>               ; ENTRY MASK
       52     0000000C'EF  D0  0002   576         MOVL    SUM_A_BLOCK, R2                  ; Get pointer to summary info.
                  53   01  D0  0009   577         MOVL    #1, R3                           ; Test number.
                               000C   578 1$:                                      ; DO
                       62  D5  000C   579         TSTL    SUM_L_HARDCNT(R2)                ; Check for any errors and
                       2B  13  000E   580         BEQL    2$                               ;  skip report if none.
                               0010   581         $ASCTIM_S -                              ; Convert run time to ASCII:
                               0010   582                 TIMBUF=QWD_TIME, -               ;  QWD of buffer for ASCII time;
                               0010   583                 TIMADR=SUM_Q_RUNTIME(R2), -      ;  64-bit run time;
                     - -       0010   584                 CVTFLG=#1                        ;  hh:mm:ss only flag.
                       01  DD  0010                       PUSHL   #1
                    04 A2  7F  0012                       PUSHAQ  SUM_Q_RUNTIME(R2)
              000000AB'EF  7F  0015                       PUSHAQ  QWD_TIME
                       00  DD  001B                       PUSHL   #0
       00010248'GF     04  FB  001D                       CALLS   #4,G^SYS$ASCTIM
                               0024   585         $DS_PRINTS_S    FMT_SUMMARY, -           ; Display summary information:
                               0024   586                 R3, -                            ;  Test number;
                               0024   587                 SUM_L_HARDCNT(R2), -             ;  Number of hard errors;
                               0024   588                 #QWD_TIME                        ;  Test run time.
              000000AB'8F  DD  0024                       PUSHL   #QWD_TIME
                       62  DD  002A                       PUSHL   SUM_L_HARDCNT(R2)
                       53  DD  002C                       PUSHL   R3
              000000BE'EF  9F  002E                       PUSHAB  FMT_SUMMARY
       000100F8 9F     04  FB  0034                       CALLS   #$$N, @#DS$PRINTS
                  52   0C  C0  003B   589 2$:     ADDL2   #SUM_K_SIZE, R2                  ; Update block pointer to next
                               003E   590                                                  ;  test.
   C6 53      00000054'FF  F3  003E   591         AOBLEQ  @L$A_TSTCNT, R3, 1$      ;   WHILE test # LEQ last test.
                               0046   592                                          ; ENDDO
                               0046   593         $DS_ENDSUMMARY
                               0046       SUMMARY_X:
       00010058 9F     6E  FA  0046                       CALLG   (SP), @#DS$BREAK
                           04  004D                       RET                      ; RETURN TO COMMAND MODE
                           0000012B                       .RESTORE
```

```
                        012B            .SBTTL  Summary Information Block Initialization Subroutine
                        012B     ;++
                        012B     ; Functional description:
                        012B     ;
                        012B     ;       This subroutine is responsible for building the structure for the
                        012B     ;       exerciser test summary information block.  This block will contain
                        012B     ;       the number of hard errors and run time for each test, which will be
                        012B     ;       displayed when a SUMMARY is requested.
                        012B     ;
                        012B     ; Calling sequence:
                        012B     ;
                        012B     ;       JSB     SUMMARY_INIT
                        012B     ;
                        012B     ; Input parameters:     None
                        012B     ;
                        012B     ; Implicit inputs:
                        012B     ;
                        012B     ;       L$A_TSTCNT      = Pointer to the number of tests in this program;
                        012B     ;       SUM_K_SIZE      = Number of bytes to be reserved for each test's data.
                        012B     ;
                        012B     ; Output parameters:    None
                        012B     ;
                        012B     ; Implicit outputs:
                        012B     ;
                        012B     ;       SUM_A_BLOCK     = Pointer to the memory reserved for the summary data;
                        012B     ;       @SUM_A_BLOCK    = The summary data block itself is cleared.
                        012B     ;
                        012B     ; Completion codes:     None
                        012B     ;
                        012B     ; Side effects:         None
                        012B     ;
                        012B     ;--
```

```
                              012B    628 SUMMARY_INIT:
                      0C  BB  012B    629         PUSHR   #^M<R2, R3>
     52  0C  00000054'FF  C5  012D    630         MULL3   @L$A_TSTCNT, -          ; Compute the amount of buffer required
                              0135    631                  #SUM_K_SIZE, R2        ;  for the summary information block.
     53  52  00000200 8F  C7  0135    632         DIVL3   #512, R2, R3            ; Convert to pages,
                      53  D6  013D    633         INCL    R3                      ;  and round up.
                              013F    634         $DS_GETBUF_S  R3, SUM_A_BLOCK   ; Request the buffer from the Supervisor.
                      00  DD  013F                        PUSHL   #0
                      00  DD  0141                        PUSHL   #0
                 FEC5 CF  7F  0143                        PUSHAQ  SUM_A_BLOCK
                      53  DD  0147                        PUSHL   R3
        00010120 9F   04  FB  0149                        CALLS   #4, @#DS$GETBUF
                              0150    635         $DS_BNERROR     10$
                      50  DD  0150                        PUSHL   R0
                      01  DD  0152                        PUSHL   #$ER
                      27  DD  0154                        PUSHL   #DS$K_BNERROR
        000100A8 9F   03  FB  0156                        CALLS   #3, @#DS$BRANCH
                   0F 50  E8  015D                        BLBS    R0, 10$
                              0160    636         $DS_ERRSYS_S
                      00  DD  0160                        PUSHL   #0
                      00  DD  0162                        PUSHL   #0
                      00  DD  0164                        PUSHL   #0
                      01  DD  0166                        PUSHL   #$ER
                              0168        ;;; GLOBAL ERROR 1
        000100C0 9F   04  FB  0168                        CALLS   #$$M, @#DS$ERRSYS
                              016F    637 10$:
             FEA0 CF  53  D0  016F    638         MOVL    R3, SUM_BLK_SIZE        ; Save the page count.
             52  FE94 CF  C0  0174    639         ADDL2   SUM_A_BLOCK, R2         ; Compute end of block address
          FE91 CF  52 01  C3  0179    640         SUBL3   #1, R2, SUM_A_BLOCK+4   ;  and save it.
                      72  D4  017F    641 20$:    CLRL    -(R2)                   ; Clear out
             FE86 CF  52  D1  0181    642         CMPL    R2, SUM_A_BLOCK         ;  the summary information
                   F7 14      0186    643         BGTR    20$                     ;  block.
                              0188    644
                      0C  BA  0188    645         POPR    #^M<R2, R3>
                          05  018A    646         RSB                             ; Return to mainline code.
```

```
                    018B          .SBTTL  Summary Information Input Subroutine
                    018B  ;++
                    018B  ; Functional description:
                    018B  ;
                    018B  ;       This subroutine is responsible for dynamically filling the test
                    018B  ;       summary information block with error data at the end of each test.
                    018B  ;
                    018B  ; Calling sequence:
                    018B  ;
                    018B  ;       JSB PART_INIT
                    018B  ;
                    018B  ; Input parameters:     None
                    018B  ;
                    018B  ;
                    018B  ; Implicit inputs:
                    018B  ;
                    018B  ;       DSA$GL_TESTNO = Current test number;
                    018B  ;       HARDCNT =       Number of hard errors, this test, this pass;
                    018B  ;       Q_TEST_TIME =   Start time of test;
                    018B  ;       SUM_A_BLOCK =   Base addresss of the summary information block;
                    018B  ;       SUM_K_SIZE =    Size of an entry in the summary information block.
                    018B  ;
                    018B  ; Output parameters:    None
                    018B  ;
                    018B  ; Implicit outputs:
                    018B  ;
                    018B  ;       SUM_L_HARDCNT(R2)         = Number of accumulated hard errors;
                    018B  ;       SUM_Q_RUNTIME(R2)         = Accumulated test run time.
                    018B  ;
                    018B  ; Completion codes:     None
                    018B  ;
                    018B  ; Side effects:         None
                    018B  ;
                    018B  ;--
```

```
                                 018B    683 PART_INIT::
       52   0C    0000FE50'EF   C5  018B    684         MULL3   DSA$GL_TESTNO, -               ; Grab the current test number and
                                    0193    685                 #SUM_K_SIZE, R2                ;  compute displacement into the
             52    FE75 CF      C0  0193    686         ADDL2   SUM_A_BLOCK, R2                ;  summary information block.
             62    FE64 CF      C0  0198    687         ADDL2   HARDCNT, -                     ; Update the tests hard count total.
                                    019D    688                 SUM_L_HARDCNT(R2)
                   FE5F CF      D4  019D    689         CLRL    HARDCNT                        ; Reinitialize exerciser hard
                                    01A1    690                                                ;  error count for next test.
                                    01A1    691 ;
                                    01A1    692 ; Compute current run time and add it to previous passes' run time.
                                    01A1    693 ;
         04 A2     FE5F CF      C0  01A1    694         ADDL2   Q_TEST_TIME, -                 ; Factor in absolute start time.
                                    01A7    695                 SUM_Q_RUNTIME(R2)
         04 A2     FE59 CF      D8  01A7    696         ADWC    Q_TEST_TIME, SUM_Q_RUNTIME(R2)
                                    01AD    697         $GETTIM_S       Q_TEST_TIME            ; Get current time.
                   FE53 CF      7F  01AD                PUSHAQ  Q_TEST_TIME
      00010378'GF       01      FB  01B1                CALLS   #1,G^SYS$GETTIM
         04 A2     FE48 CF      C2  01B8    698         SUBL2   Q_TEST_TIME, -                 ; Factor out absolute time;
                                    01BE    699                 SUM_Q_RUNTIME(R2)              ;  result is delta time.
         04 A2     FE42 CF      D9  01BE    700         SBWC    Q_TEST_TIME, SUM_Q_RUNTIME(R2)
                                    01C4    701
                                05  01C4    702         RSB                                    ;Back into the stream of things!
                                    01C5    703
                                    01C5    704         $DS_ENDMOD
                                    01C5    705         .END
```

```
$$E                             = 00000001                CHF$L_SIG_ARGS                  00000000
$$M                             = 00000004                CHF$L_SIG_NAME                  00000004
$$N                             = 00000000                CHI$M_CHNINT                  = 00000001  G
$$S                             = FFFFFFFF                CHI$M_DEVINT                  = 00000002  G
$ENV                            = 00000001  G             CHI$M_IPL                     = 0000007C  G
$ER                             = 00000002                CHI$S_IPL                     = 00000005  G
$MO                             = 00000001  G             CHI$V_CHNINT                  = 00000000  G
$ST                             = 00000000                CHI$V_DEVINT                  = 00000001  G
$TN                             = 00000000                CHI$V_IPL                     = 00000002  G
AEM                               00000171 R      02      CHM$_FORWARD                  = 00000000  G
AKM                               0000016A R      02      CHM$_INVALIDATE               = 00000001  G
ALL                             = 00000008  G             CHM$_MAP                      = 00000002  G
AL_DEVTYP                         0000009B R      09      CHM$_MFWDN                    = 00000002  G
ASM                               0000017B R      02      CHM$_MFWDNO                   = 0000000A  G
AUM                               00000186 R      02      CHM$_MFWDV                    = 00000003  G
A_BUFFER_BEGIN                    00000000 RG     02      CHM$_MFWDVO                   = 0000000B  G
A_BUFFER_END                      00000004 RG     02      CHM$_MREVN                    = 00000006  G
A_FREE_MEM                        00000048 RG     02      CHM$_MREVNO                   = 0000000E  G
A_HALT_BUFFER                     00000010 RG     02      CHM$_MREVV                    = 00000007  G
A_HEADEND                         00000058 R      04      CHM$_MREVVO                   = 0000000F  G
A_MCHK_BUFFER                     00000018 RG     02      CHM$_NFWDN                    = 00000000  G
A_MEM_CSR_1                     = 00F20004                CHM$_NREVN                    = 00000004  G
A_PSLMNE                          00000115 RG     02      CHM$_OFFSET                   = 00000008  G
A_PWR_BUFFER                      00000008 RG     02      CHM$_REVERSE                  = 00000004  G
A_P_TABLE                         0000006D R      02      CHS$M_BUSIC                   = 00800000  G
A_UBE_BUFFER_0                    00000028 RG     02      CHS$M_BUSINIT                 = 00400000  G
A_UBE_BUFFER_1                    00000030 RG     02      CHS$M_BUSNXM                  = 08000000  G
A_UBE_BUFFER_2                    00000038 RG     02      CHS$M_BUSPDN                  = 01000000  G
A_UBE_BUFFER_3                    00000040 RG     02      CHS$M_CHNDPE                  = 00000040  G
A_WCS_BUFFER                      00000020 RG     02      CHS$M_CHNERR                  = 00000002  G
BE0_UNIT_NO                       0000007D RG     02      CHS$M_CHNMPE                  = 00000080  G
BE1_UNIT_NO                       00000081 RG     02      CHS$M_CHPFOT                  = 00000100  G
BE2_UNIT_NO                       00000085 RG     02      CHS$M_DEVBUS                  = 00000010  G
BE3_UNIT_NO                       00000089 RG     02      CHS$M_DEVERR                  = 00000004  G
BIT...                          = 00000028                CHS$M_DEVTO                   = 00000020  G
BUF_SIZE                        = 0000000B                CHS$M_ERRANY                  = 0000000F  G
B_TU58_DRIVE                      0000006C RG     02      CHS$M_MBAATN                  = 00100000  G
CEP_FUNCTIONAL                  = 00000000                CHS$M_MBACPE                  = 00200000  G
CEP_REPAIR                      = 00000001                CHS$M_MBADTB                  = 00040000  G
CHC$_ABORT                      = 00000002  G             CHS$M_MBADTC                  = 00080000  G
CHC$_CLEAR                      = 00000006  G             CHS$M_MBAEXC                  = 00010000  G
CHC$_CLRDFT                     = 00000009  G             CHS$M_MBANED                  = 00020000  G
CHC$_DSINT                      = 00000005  G             CHS$M_MBAWCKLWR               = 02000000  G
CHC$_ENINT                      = 00000004  G             CHS$M_MBAWCKUPR               = 04000000  G
CHC$_INITA                      = 00000000  G             CHS$M_PGMERR                  = 00000008  G
CHC$_INITB                      = 00000001  G             CHS$M_PGMHDE                  = 00000800  G
CHC$_PURGE                      = 00000003  G             CHS$M_SYSERR                  = 00000001  G
CHC$_SETDFT                     = 00000008  G             CHS$M_SYSMEM                  = 00000200  G
CHC$_STATUS                     = 00000007  G             CHS$M_SYSSBI                  = 00000400  G
CHF$L_MCHARGLST                   00000008                CHS$V_BUSIC                   = 00000017  G
CHF$L_MCH_ARGS                    00000000                CHS$V_BUSINIT                 = 00000016  G
CHF$L_MCH_DEPTH                   00000008                CHS$V_BUSNXM                  = 0000001B  G
CHF$L_MCH_FRAME                   00000004                CHS$V_BUSPDN                  = 00000018  G
CHF$L_MCH_SAVR0                   0000000C                CHS$V_CHNDPE                  = 00000006  G
CHF$L_MCH_SAVR1                   00000010                CHS$V_CHNERR                  = 00000001  G
CHF$L_SIGARGLST                   00000004                CHS$V_CHNMPE                  = 00000007  G
CHF$L_SIG_ARG1                    00000008                CHS$V_CHPFOT                  = 00000008  G
```

```
CHS$V_DEVBUS                   = 00000004  G           DS$K_BBCCI                    = 00000023  G
CHS$V_DEVERR                   = 00000002  G           DS$K_BBCS                     = 0000001F  G
CHS$V_DEVTO                    = 00000005  G           DS$K_BBS                      = 0000001C  G
CHS$V_MBAATN                   = 00000014  G           DS$K_BBSC                     = 00000020  G
CHS$V_MBACPE                   = 00000015  G           DS$K_BBSS                     = 0000001E  G
CHS$V_MBADTB                   = 00000012  G           DS$K_BBSSI                    = 00000022  G
CHS$V_MBADTC                   = 00000013  G           DS$K_BCC_M                    = 0000001B  G
CHS$V_MBAEXC                   = 00000010  G           DS$K_BCS_M                    = 0000001A  G
CHS$V_MBANED                   = 00000011  G           DS$K_BEQLU_B                  = 00000005  G
CHS$V_MBAWCKLWR                = 00000019  G           DS$K_BEQLU_M                  = 00000011  G
CHS$V_MBAWCKUPR                = 0000001A  G           DS$K_BEQL_B                   = 00000004  G
CHS$V_PGMERR                   = 00000003  G           DS$K_BEQL_M                   = 00000010  G
CHS$V_PGMHDE                   = 0000000B  G           DS$K_BERROR                   = 00000026  G
CHS$V_SYSERR                   = 00000000  G           DS$K_BGEQU_B                  = 00000007  G
CHS$V_SYSMEM                   = 00000009  G           DS$K_BGEQU_M                  = 00000013  G
CHS$V_SYSSBI                   = 0000000A  G           DS$K_BGEQ_B                   = 00000006  G
CLEAN_UP                         00000000 R      0B    DS$K_BGEQ_M                   = 00000012  G
CLEAN_UP_X                       000000EB R      0B    DS$K_BGTRU_B                  = 00000009  G
CPU$V_COMET                    = 00000002              DS$K_BGTRU_M                  = 00000015  G
CPU$V_HS                       = 00000000              DS$K_BGTR_B                   = 00000008  G
CPU$V_STAR                     = 00000001              DS$K_BGTR_M                   = 00000014  G
DEFAULT                        = 00000000  G           DS$K_BLBC                     = 00000025  G
DEV_REG                          00000000 R      09    DS$K_BLBS                     = 00000024  G
DISPATCH                         00000000 R      07    DS$K_BLEQU_B                  = 00000003  G
DS$ABORT                         00010020  G           DS$K_BLEQU_M                  = 0000000F  G
DS$ASKADR                        00010090  G           DS$K_BLEQ_B                   = 00000002  G
DS$ASKDATA                       00010080  G           DS$K_BLEQ_M                   = 0000000E  G
DS$ASKLGCL                       00010098  G           DS$K_BLSSU_B                  = 00000001  G
DS$ASKSTR                        000100A0  G           DS$K_BLSSU_M                  = 0000000D  G
DS$ASKVLD                        00010088  G           DS$K_BLSS_B                   = 00000000  G
DS$ATTACH                        000101A8  G           DS$K_BLSS_M                   = 0000000C  G
DS$BGNSUB                        00010030  G           DS$K_BNEQU_B                  = 0000000B  G
DS$BRANCH                        000100A8  G           DS$K_BNEQU_M                  = 00000017  G
DS$BREAK                         00010058  G           DS$K_BNEQ_B                   = 0000000A  G
DS$CANWAIT                       00010070  G           DS$K_BNEQ_M                   = 00000016  G
DS$CHANNEL                       00010180  G           DS$K_BNERROR                  = 00000027  G
DS$CKLOOP                        00010040  G           DS$K_BVC_M                    = 00000019  G
DS$CLRVEC                        00010168  G           DS$K_BVS_M                    = 00000018  G
DS$CNTRLC                        00010078  G           DS$K_ERROR                    = 00000002  G
DS$CVTREG                        000100B0  G           DS$K_NORMAL                   = 00000001  G
DS$ENDPASS                       00010010  G           DS$K_SEVERE                   = 00000004  G
DS$ENDSUB                        00010038  G           DS$K_SUBSYS                   = 00000066  G
DS$ERRDEV                        000100C8  G           DS$K_WARNING                  = 00000000  G
DS$ERRHARD                       000100D0  G           DS$LOAD                         00010198  G
DS$ERRPREP                       00010108  G           DS$LOADPCS                      000101C0  G
DS$ERRSOFT                       000100D8  G           DS$MAPDBGBLOCK                  00010118  G
DS$ERRSYS                        000100C0  G           DS$MMOFF                        00010158  G
DS$ESCAPE                        00010050  G           DS$MMON                         00010150  G
DS$FREEDBGSYM                    000101B8  G           DS$MOVPHY                       00010148  G
DS$GETBUF                        00010120  G           DS$MOVVRT                       00010140  G
DS$GETMEM                        00010130  G           DS$PARSE                        000100B8  G
DS$GPHARD                        00010018  G           DS$PRINTB                       000100E0  G
DS$HELP                          000101B0  G           DS$PRINTF                       000100F0  G
DS$INITSCB                       00010170  G           DS$PRINTS                       000100F8  G
DS$INLOOP                        00010048  G           DS$PRINTSIG                     00010100  G
DS$K_BBC                       = 0000001D  G           DS$PRINTX                       000100E8  G
DS$K_BBCC                      = 00000021  G           DS$PROBE                        000101A0  G
```

```
DS$RELBUF                       00010128  G        DSA$GL_PASSES                   0000FE08
DS$RELMEM                       00010138  G        DSA$GL_PASSNO                   0000FE54
DS$SETIPL                       00010178  G        DSA$GL_SECTNO                   0000FE10
DS$SETMAP                       00010188  G        DSA$GL_SID                      0000FE14
DS$SETPRIEXV                    00010110  G        DSA$GL_SUBTNO                   0000FE4C
DS$SETVEC                       00010160  G        DSA$GL_TESTNO                   0000FE50
DS$SHOCHAN                      00010190  G        DSA$GL_UNITS                    0000FE0C
DS$SUMMARY                      00010028  G        DSA$GQ_MSGPTR                   0000FE68
DS$WAITMS                       00010060  G        DSA$GT_DEVNAM                   0000FE5C
DS$WAITUS                       00010068  G        DSA$M_APT                     = 80000000
DS$_ARITH                     = 006600D0  G        DSA$M_BELL                    = 00000008
DS$_BADLINK                   = 006600F0  G        DSA$M_BINARY                  = 00000002
DS$_BADTYPE                   = 006600E8  G        DSA$M_CRD_AUTOTEST            = 00000800
DS$_CHME                      = 006600A8  G        DSA$M_CRD_MENUTEST            = 00010000
DS$_CHMK                      = 006600E0  G        DSA$M_CRD_TRACE               = 00020000
DS$_DEVNAME                   = 00660108  G        DSA$M_DEBUG                   = 04000000
DS$_ERROR                     = 00660002  G        DSA$M_HALT                    = 00000001
DS$_FHWE                      = 00660068  G        DSA$M_IE1                     = 00000010
DS$_FRAGBUF                   = 00660080  G        DSA$M_IE2                     = 00000020
DS$_ICBUSY                    = 006600C8  G        DSA$M_IE3                     = 00000040
DS$_ICERR                     = 006600C0  G        DSA$M_IES                     = 00000080
DS$_IHWE                      = 00660060  G        DSA$M_LOAD_DEBUGGER           = 40000000
DS$_ILLCHAR                   = 00660018  G        DSA$M_LOOP                    = 00000004
DS$_ILLPAGCNT                 = 00660078  G        DSA$M_NORPT                   = 08000000
DS$_ILLUNIT                   = 00660100  G        DSA$M_OPER                    = 00001000
DS$_INSFMEM                   = 00660050  G        DSA$M_PASSO                   = 20000000
DS$_IPL2HI                    = 006600B8  G        DSA$M_PROMPT                  = 00002000
DS$_IVADDR                    = 00660040  G        DSA$M_QA                      = 00008000
DS$_IVVECT                    = 00660038  G        DSA$M_QUICK                   = 00000100
DS$_KRNLSTK                   = 00660090  G        DSA$M_SEARCH                  = 00004000
DS$_LOGIC                     = 00660070  G        DSA$M_TRACE                   = 00000400
DS$_MCHK                      = 00660088  G        DSA$M_USER                    = 10000000
DS$_MMOFF                     = 00660058  G        DSA$M_VERIFY                  = 00000200
DS$_NEEDUNIT                  = 006600F8  G        DSA$V_APT                     = 0000001F
DS$_NOPCS                     = 00660110  G        DSA$V_BELL                    = 00000003
DS$_NORMAL                    = 00660001  G        DSA$V_BINARY                  = 00000001
DS$_NOSUPPORT                 = 006600B1  G        DSA$V_CRD_AUTOTEST            = 0000000B
DS$_NOTDON                    = 00660030  G        DSA$V_CRD_MENUTEST            = 00000010
DS$_NOTIMP                    = 006600B0  G        DSA$V_CRD_TRACE               = 00000011
DS$_NULLSTR                   = 00660010  G        DSA$V_DEBUG                   = 0000001A
DS$_OVERFLOW                  = 00660008  G        DSA$V_HALT                    = 00000000
DS$_POWER                     = 00660098  G        DSA$V_IE1                     = 00000004
DS$_PROGERR                   = 00660020  G        DSA$V_IE2                     = 00000005
DS$_SEVERE                    = 00660004  G        DSA$V_IE3                     = 00000006
DS$_TRANSL                    = 006600A0  G        DSA$V_IES                     = 00000007
DS$_TRUNCATE                  = 00660028  G        DSA$V_LOAD_DEBUGGER           = 0000001E
DS$_UNEXPINT                  = 006600D8  G        DSA$V_LOOP                    = 00000002
DS$_VASFULL                   = 00660048  G        DSA$V_NORPT                   = 0000001B
DS$_WARNING                   = 00660000  G        DSA$V_OPER                    = 0000000C
DSA$AL_APTMAIL                  0000FE00           DSA$V_PASSO                   = 0000001D
DSA$AT_APTTXT                   0000FA00           DSA$V_PROMPT                  = 0000000D
DSA$GL_APTCOM                   0000FE04           DSA$V_QA                      = 0000000F
DSA$GL_DEVLEN                   0000FE58           DSA$V_QUICK                   = 00000008
DSA$GL_ERRNO                    0000FE44           DSA$V_SEARCH                  = 0000000E
DSA$GL_EVENT                    0000FE48           DSA$V_TRACE                   = 0000000A
DSA$GL_FLAGS                    0000FE00           DSA$V_USER                    = 0000001C
DSA$GL_MSGTYP                   0000FE40           DSA$V_VERIFY                  = 00000009
```

```
ENV$M_DOMAIN                  = 00000002                 KA$V_F_FLOAT                  = 00000000
ENV$M_LEVEL                   = 00000001                 KA$V_G_FLOAT                  = 00000002
ENV$M_SUPER                   = 000003FC                 KA$V_H_FLOAT                  = 00000003
ENV$S_DOMAIN                  = 00000001                 KA$V_PACKED                   = 00000005
ENV$S_LEVEL                   = 00000001                 KA$V_PACK_MUL                 = 00000006
ENV$S_SUPER                   = 00000008                 KA$V_TODR                     = 00000010
ENV$V_DOMAIN                  = 00000001                 KA$W_LATENCY                    0000003E
ENV$V_LEVEL                   = 00000000                 KA$W_PROGRESS                   00000040
ENV$V_SUPER                   = 00000002                 KA$W_RESERVED                   00000038
ENV$_CPU                      = 00000000                 KA$W_WCS                        00000036
ENV$_FUNCTIONAL               = 00000000                 KA730                         = 00000001
ENV$_REPAIR                   = 00000001                 KA730_REV_54                  = 03003600  G
ENV$_SUPER                    = 00000001                 KA_PTABLE                       0000018B RG      02
ENV$_SYSTEM                   = 00000001                 KA_UNIT_NO                      00000071 RG      02
FMT_SUMMARY                     000000BE R       09      L$A_CCP                         00000040 R       04
GPR_TABLE                       00000095 RG      02      L$A_DEVP                        0000001C R       04
HALT                          = 00000004  G              L$A_DREG                        00000024 R       04
HARDCNT                         00000000 RG      09      L$A_DTP                         00000018 R       04
HP$A_DEPENDENT                  00000032                 L$A_ICP                         0000003C R       04
HP$A_DEVICE                     00000018                 L$A_LASTAD                      00000014 R       04
HP$A_DVA                        0000001C                 L$A_NAME                        00000008 R       04
HP$A_LINK                       00000020                 L$A_REPP                        00000044 R       04
HP$B_DRIVE                      0000000B                 L$A_SECNAM                      00000050 R       04
HP$B_FLAGS                      0000000A                 L$A_STATAB                      00000048 R       04
HP$KA_L_FLAGS                 = 0000000C                 L$A_TSTCNT                      00000054 R       04
HP$KA_MEM_SIZE                = 00000044                 L$L_ENVIRON                     00000004 R       04
HP$M_ALLOC                    = 00000001                 L$L_ERRTYP                      0000004C R       04
HP$M_WASALL                   = 00000002                 L$L_HEADLENGTH                  00000000 R       04
HP$Q_DEVICE                     00000000                 L$L_REV                         0000000C R       04
HP$T_DEVICE                     0000000C                 L$L_UNIT                        00000020 R       04
HP$T_TYPE                       00000026                 L$L_UPDATE                      00000010 R       04
HP$V_ALLOC                    = 00000000                 LASTAD                          00000000 R       05
HP$V_WASALL                   = 00000001                 LDPCTX                        = 0000000B  G
HP$W_SIZE                       00000008                 L_ACT_ISP                       00000058 RG      02
HP$W_VECTOR                     00000024                 L_ACT_KSP                       00000054 RG      02
INITIALIZE                      00000000 R       0A      L_ACT_PSL                       0000005C RG      02
INITIALIZE_X                    00000262 R       0A      L_ACT_SP                        00000050 RG      02
IPR                           = 00000006  G              L_EXP_AP                        000000C5 RG      02
KA$B_ACC_TYPE                   00000042                 L_EXP_FP                        000000C9 RG      02
KA$B_SID_TYPE                   0000003D                 L_EXP_ISP                       000000D5 RG      02
KA$K_LEN                        00000043                 L_EXP_KSP                       000000D1 RG      02
KA$L_FLAGS                      00000032                 L_EXP_PSL                       000000D9 RG      02
KA$L_SID                        0000003A                 L_EXP_SP                        000000CD RG      02
KA$M_CHAR                     = 00000100                 L_ISP                           00000064 RG      02
KA$M_CRC                      = 00000010                 L_KA_FLAGS                      0000008D RG      02
KA$M_D_FLOAT                  = 00000002                 L_KSIZE_PTBL                    00000091 RG      02
KA$M_EDIT                     = 00000080                 L_KSP                           00000060 RG      02
KA$M_F_FLOAT                  = 00000001                 L_LAST_UBE                      00000068 RG      02
KA$M_G_FLOAT                  = 00000004                 L_TSTCNT                        00000000 R       06
KA$M_H_FLOAT                  = 00000008                 MANUAL                        = 00000001  G
KA$M_PACKED                   = 00000020                 MCHK                          = 00000005  G
KA$M_PACK_MUL                 = 00000040                 MEM                           = 00000009  G
KA$M_TODR                     = 00010000                 MM_MSG                          000000EE R       09
KA$V_CHAR                     = 00000008                 MODELIST                        00000156 RG      02
KA$V_CRC                      = 00000004                 M_DSABL_ECC                   = 02000000
KA$V_D_FLOAT                  = 00000001                 PAR$M_ATDEF                   = 00000010
KA$V_EDIT                     = 00000007                 PAR$M_ATHI                    = 00000008
```

```
PAR$M_ATLO                      = 00000004                 PR$_PCBB                        = 00000010  G
PAR$M_NODEF                     = 00000002                 PR$_PME                         = 0000003D  G
PAR$V_ATDEF                     = 00000004                 PR$_RXCS                        = 00000020  G
PAR$V_ATHI                      = 00000003                 PR$_RXDB                        = 00000021  G
PAR$V_ATLO                      = 00000002                 PR$_SBIER                       = 00000034  G
PAR$V_NODEF                     = 00000001                 PR$_SBIFS                       = 00000030  G
PAR$_BIN                        = 00000002                 PR$_SBIMT                       = 00000033  G
PAR$_DEC                        = 0000000A                 PR$_SBIQC                       = 00000036  G
PAR$_HEX                        = 00000010                 PR$_SBIS                        = 00000031  G
PAR$_NO                         = 00000000                 PR$_SBISC                       = 00000032  G
PAR$_OCT                        = 00000008                 PR$_SBITA                       = 00000035  G
PAR$_YES                        = 00000001                 PR$_SBR                         = 0000000C  G
PART_INIT                         0000018B RG      09      PR$_SCBB                        = 00000011  G
POWER                           = 00000003  G              PR$_SID                         = 0000003E  G
PR$S_SID_ECO                    = 00000009  G              PR$_SID_TYP730                  = 00000003  G
PR$S_SID_PL                     = 00000003  G              PR$_SID_TYP750                  = 00000002  G
PR$S_SID_SN                     = 0000000C  G              PR$_SID_TYP780                  = 00000001  G
PR$S_SID_TYPE                   = 00000008  G              PR$_SID_TYP7VV                  = 00000004  G
PR$V_SID_ECO                    = 0000000F  G              PR$_SID_TYPMAX                  = 00000004  G
PR$V_SID_PL                     = 0000000C  G              PR$_SIRR                        = 00000014  G
PR$V_SID_SN                     = 00000000  G              PR$_SISR                        = 00000015  G
PR$V_SID_TYPE                   = 00000018  G              PR$_SLR                         = 0000000D  G
PR$_ACCR                        = 00000029  G              PR$_SSP                         = 00000002  G
PR$_ACCS                        = 00000028  G              PR$_TBCHK                       = 0000003F  G
PR$_ASTLVL                      = 00000013  G              PR$_TBDR                        = 00000024  G
PR$_CADR                        = 00000025  G              PR$_TBIA                        = 00000039  G
PR$_CAER                        = 00000027  G              PR$_TBIS                        = 0000003A  G
PR$_CMIERR                      = 00000017  G              PR$_TODR                        = 0000001B  G
PR$_CRBT                        = 00000043  G              PR$_TXCS                        = 00000022  G
PR$_CSRD                        = 0000001D  G              PR$_TXDB                        = 00000023  G
PR$_CSRS                        = 0000001C  G              PR$_UBRESET                     = 00000037  G
PR$_CSTD                        = 0000001F  G              PR$_USP                         = 00000003  G
PR$_CSTS                        = 0000001E  G              PR$_WCSA                        = 0000002C  G
PR$_CSWP                        = 00000042  G              PR$_WCSD                        = 0000002D  G
PR$_ESP                         = 00000001  G              PSL$C_EXEC                      = 00000001  G
PR$_ICCS                        = 00000018  G              PSL$C_KERNEL                    = 00000000  G
PR$_ICR                         = 0000001A  G              PSL$C_SUPER                     = 00000002  G
PR$_IPL                         = 00000012  G              PSL$C_USER                      = 00000003  G
PR$_ISP                         = 00000004  G              PSL$K_EXEC                      = 00000001  G
PR$_KSP                         = 00000000  G              PSL$K_KERNEL                    = 00000000  G
PR$_MAPEN                       = 00000038  G              PSL$K_SUPER                     = 00000002  G
PR$_MCESR                       = 00000026  G              PSL$K_USER                      = 00000003  G
PR$_MCTL1                       = 00000044  G              PSL$M_C                         = 00000001  G
PR$_MCTL2                       = 00000045  G              PSL$M_CBIT                      = 00000001  G
PR$_MDCR1                       = 00000049  G              PSL$M_CM                        = 80000000  G
PR$_MEAR                        = 00000048  G              PSL$M_CURMOD                    = 03000000  G
PR$_MECCR                       = 0000004B  G              PSL$M_DV                        = 00000080  G
PR$_MEDR                        = 0000004A  G              PSL$M_FPD                       = 08000000  G
PR$_MGEN                        = 00000046  G              PSL$M_FU                        = 00000040  G
PR$_MTBER                       = 00000047  G              PSL$M_IPL                       = 001F0000  G
PR$_NICR                        = 00000019  G              PSL$M_IS                        = 04000000  G
PR$_P0BR                        = 00000008  G              PSL$M_IV                        = 00000020  G
PR$_P0LR                        = 00000009  G              PSL$M_N                         = 00000008  G
PR$_P1BR                        = 0000000A  G              PSL$M_NBIT                      = 00000008  G
PR$_P1LR                        = 0000000B  G              PSL$M_PRVMOD                    = 00C00000  G
PR$_PAMACC                      = 00000040  G              PSL$M_SAFBITS                   = 000037FF  G
PR$_PAMLOC                      = 00000041  G              PSL$M_TBIT                      = 00000010  G
```

```
PSL$M_TP            = 40000000  G          SCB$L_SFTLVL6         00000098  G
PSL$M_V             = 00000002  G          SCB$L_SFTLVL7         0000009C  G
PSL$M_VBIT          = 00000002  G          SCB$L_SFTLVL8         000000A0  G
PSL$M_Z             = 00000004  G          SCB$L_SFTLVL9         000000A4  G
PSL$M_ZBIT          = 00000004  G          SCB$L_TBIT            00000028  G
PSL$S_CURMOD        = 00000002  G          SCB$L_TIMER           000000C0  G
PSL$S_IPL           = 00000005  G          SCB$L_TRANSL          00000024  G
PSL$S_PRVMOD        = 00000002  G          SCB$L_TXDB            000000FC  G
PSL$V_C             = 00000000  G          SCB$L_UBE_0         = 00000348
PSL$V_CBIT          = 00000000  G          SCB$L_UBE_1         = 0000034C
PSL$V_CM            = 0000001F  G          SCB$L_UBE_2         = 00000350
PSL$V_CURMOD        = 00000018  G          SCB$L_UBE_3         = 00000354
PSL$V_DV            = 00000007  G          SCB$L_ZERO            00000000  G
PSL$V_FPD           = 0000001B  G          SECTION               00000057 R      09
PSL$V_FU            = 00000006  G          SEP_FUNCTIONAL      = 00000002
PSL$V_IPL           = 00000010  G          SEP_REPAIR          = 00000003
PSL$V_IS            = 0000001A  G          SIZ...              = 00000001
PSL$V_IV            = 00000005  G          SUMMARY               00000000 R      0C
PSL$V_N             = 00000003  G          SUMMARY_INIT          0000012B R      09
PSL$V_NBIT          = 00000003  G          SUMMARY_X             00000046 R      0C
PSL$V_PRVMOD        = 00000016  G          SUM_A_BLOCK           0000000C R      09
PSL$V_TBIT          = 00000004  G          SUM_BLK_SIZE          00000014 R      09
PSL$V_TP            = 0000001E  G          SUM_K_SIZE            0000000C  G
PSL$V_V             = 00000001  G          SUM_L_HARDCNT         00000000  G
PSL$V_VBIT          = 00000001  G          SUM_Q_RUNTIME         00000004  G
PSL$V_Z             = 00000002  G          SYS$ALLOC             00010238  G
PSL$V_ZBIT          = 00000002  G          SYS$ASCTIM            00010248  G
QWD_TIME              000000AB R      09   SYS$ASSIGN            00010250  G
Q_TEST_TIME           00000004 R      09   SYS$BINTIM            00010258  G
REG_TABLE             000000DD RG     02   SYS$CANCEL            00010260  G
SCB$L_ACCESS          00000020  G          SYS$CANTIM            00010268  G
SCB$L_ARITH           00000034  G          SYS$CLOSE             000105B8  G
SCB$L_BREAK           0000002C  G          SYS$CLREF             00010298  G
SCB$L_CHME            00000044  G          SYS$CONNECT           000105C0  G
SCB$L_CHMK            00000040  G          SYS$DALLOC            000102D8  G
SCB$L_CHMS            00000048  G          SYS$DASSGN            000102E0  G
SCB$L_CHMU            0000004C  G          SYS$DISCONNECT        000105D0  G
SCB$L_COMPAT          00000030  G          SYS$FAO               00010350  G
SCB$L_KNLSTK          00000008  G          SYS$FAOL              00010358  G
SCB$L_MACHCHK         00000004  G          SYS$GET               00010580  G
SCB$L_OPCCUS          00000014  G          SYS$GETCHN            000104C8  G
SCB$L_OPCDEC          00000010  G          SYS$GETTIM            00010378  G
SCB$L_POWER           0000000C  G          SYS$LKWSET            000103A0  G
SCB$L_RADRMOD         0000001C  G          SYS$NUMTIM            000103B8  G
SCB$L_ROPRAND         00000018  G          SYS$OPEN              00010608  G
SCB$L_RXDB            000000F8  G          SYS$QIO               000103C8  G
SCB$L_SFTLVL1         00000084  G          SYS$QIOW              00010200  G
SCB$L_SFTLVL10        000000A8  G          SYS$READ              00010590  G
SCB$L_SFTLVL11        000000AC  G          SYS$READEF            000103D0  G
SCB$L_SFTLVL12        000000B0  G          SYS$SETAST            000103F8  G
SCB$L_SFTLVL13        000000B4  G          SYS$SETEF             00010400  G
SCB$L_SFTLVL14        000000B8  G          SYS$SETIMR            00010420  G
SCB$L_SFTLVL15        000000BC  G          SYS$SETPRI            00010428  G
SCB$L_SFTLVL2         00000088  G          SYS$SETPRT            00010430  G
SCB$L_SFTLVL3         0000008C  G          SYS$SETRWM            00010438  G
SCB$L_SFTLVL4         00000090  G          SYS$SETSWM            00010448  G
SCB$L_SFTLVL5         00000094  G          SYS$ULKPAG            00010460  G
```

```
SYS$ULWSET                          00010468  G
SYS$UNWIND                          00010470  G
SYS$WAITFR                          00010478  G
SYS$WFLAND                          00010488  G
SYS$WFLOR                           00010490  G
S_ALL                               00000044 R      09
S_DEFAULT                           00000018 R      09
S_HALT                              00000032 R      09
S_IPR                               0000003C R      09
S_LDPCTX                            00000050 R      09
S_MANUAL                            00000020 R      09
S_MCHK                              00000037 R      09
S_MEM                               00000048 R      09
S_POWER                             0000002C R      09
S_TU58                              00000027 R      09
S_UBI                               0000004C R      09
S_WCS                               00000040 R      09
TU0_UNIT_NO                         00000075 RG     02
TU1_UNIT_NO                         00000079 RG     02
TU58                              = 00000002  G
T_KA730                             0000008B R      09
T_NAME                              00000058 R      04
T_TIME                              000000B3 R      09
T_TU58                              00000091 R      09
T_UBE                               00000096 R      09
UBE                               = 00000003
UBI                               = 0000000A  G
WCS                               = 00000007  G


                                             +-----------------+
                                             ! Psect synopsis !
                                             +-----------------+

PSECT name                         Allocation          PSECT No.  Attributes
----------                         ----------          ---------  ----------

.  ABS  .                          00000000  (    0.)  00 (  0.)  NOPIC    USR    CON    ABS    LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
. BLANK .                          00000000  (    0.)  01 (  1.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
ENKAX1                             0000018F  (  399.)  02 (  2.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
$ABS$                              00010610  (67088.)  03 (  3.)  NOPIC    USR    CON    ABS    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
$HEADER                            00000092  (  146.)  04 (  4.)  NOPIC    USR    CON    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC PAGE
_LAST                              00000000  (    0.)  05 (  5.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC PAGE
$TSTCNT                            00000000  (    0.)  06 (  6.)  NOPIC    USR    OVR    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
DISPATCH                           00000000  (    0.)  07 (  7.)  NOPIC    USR    CON    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
DISPATCH_X                         00000018  (   24.)  08 (  8.)  NOPIC    USR    CON    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
DATA                               000001C5  (  453.)  09 (  9.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC PAGE
INITIALIZE                         0000026A  (  618.)  0A ( 10.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC LONG
CLEANUP                            000000F3  (  243.)  0B ( 11.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC LONG
SUMMARY                            0000004E  (   78.)  0C ( 12.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC LONG
```

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                                              +-------------------------+
                                              ! Symbol Cross Reference !
                                              +-------------------------+
SYMBOL                           VALUE        DEFINITION        REFERENCES...
------                           -----        ----------        -------------
$$E                             =00000001     495     (8)        458     (7)        520   (8)
$$M                             =00000004     636     (12)       636     (12)
$$N                             =00000000     636     (12)       303     (5)        311   (5)      #-375   (7)        588   (10)
                                                                 636     (12)
$$S                             =FFFFFFFF     66      (2)
$ENV                            =00000001     66      (2)        212     (3)
$ER                             =00000002     636     (12)       367     (7)      #-387   (7)        495   (8)      #-635   (12)
                                                               #-636     (12)
$MO                             =00000001     704     (14)       704     (14)
$ST                             =00000000     520     (8)        458     (7)        520   (8)        636   (12)
$TN                             =00000000     66      (2)        367     (7)        495   (8)        575   (10)       704   (14)
AEM                              00000171-R   191     (2)        186     (2)
AKM                              0000016A-R   190     (2)        185     (2)
ALL                             =00000008     303     (5)
AL_DEVTYP                        0000009B-R   311     (5)        212     (3)
ASM                              0000017B-R   192     (2)        187     (2)
AUM                              00000186-R   193     (2)        188     (2)
A_BUFFER_BEGIN                   00000000-R   106     (2)        446     (7)
A_BUFFER_END                     00000004-R   107     (2)
A_FREE_MEM                       00000048-R   116     (2)        434     (7)      #-437   (7)      #-440   (7)
A_HALT_BUFFER                    00000010-R   109     (2)        448     (7)
A_HEADEND                        00000058-R   212     (3)        212     (3)
A_MCHK_BUFFER                    00000018-R   110     (2)        449     (7)
A_MEM_CSR_1                     =00F20004     101     (2)      #-519     (8)
A_PSLMNE                         00000115-R   180     (2)
A_PWR_BUFFER                     00000008-R   108     (2)        447     (7)
A_P_TABLE                        0000006D-R   127     (2)        386     (7)      #-389   (7)      #-411   (7)      #-419   (7)
A_UBE_BUFFER_0                   00000028-R   112     (2)        451     (7)
A_UBE_BUFFER_1                   00000030-R   113     (2)        452     (7)
A_UBE_BUFFER_2                   00000038-R   114     (2)        453     (7)
A_UBE_BUFFER_3                   00000040-R   115     (2)        454     (7)
A_WCS_BUFFER                     00000020-R   111     (2)        450     (7)
BE0_UNIT_NO                      0000007D-R   131     (2)      #-378     (7)      #-398   (7)
BE1_UNIT_NO                      00000081-R   132     (2)      #-379     (7)      #-400   (7)
BE2_UNIT_NO                      00000085-R   133     (2)      #-380     (7)      #-402   (7)
BE3_UNIT_NO                      00000089-R   134     (2)      #-381     (7)      #-404   (7)
BIT...                          =00000028     88      (2)         66     (2)         78   (2)         80   (2)         81   (2)
                                                                  82     (2)         84   (2)         86   (2)         87   (2)
                                                                  88     (2)
BUF_SIZE                        =0000000B     316     (5)        318     (5)        321   (5)
B_TU58_DRIVE                     0000006C-R   126     (2)      #-384     (7)      #-423   (7)      #-427   (7)
CEP_FUNCTIONAL                  =00000000     66      (2)
CEP_REPAIR                      =00000001     66      (2)         66     (2)
CHC$_ABORT                      =00000002     84      (2)
CHC$_CLEAR                      =00000006     84      (2)
CHC$_CLRDFT                     =00000009     84      (2)
CHC$_DSINT                      =00000005     84      (2)
CHC$_ENINT                      =00000004     84      (2)
CHC$_INITA                      =00000000     84      (2)
CHC$_INITB                      =00000001     84      (2)
```

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CHC$_PURGE                       =00000003      84       (2)
CHC$_SETDFT                      =00000008      84       (2)
CHC$_STATUS                      =00000007      84       (2)
CHF$L_MCHARGLST                   00000008      85       (2)
CHF$L_MCH_ARGS                    00000000      85       (2)
CHF$L_MCH_DEPTH                   00000008      85       (2)
CHF$L_MCH_FRAME                   00000004      85       (2)
CHF$L_MCH_SAVR0                   0000000C      85       (2)
CHF$L_MCH_SAVR1                   00000010      85       (2)
CHF$L_SIGARGLST                   00000004      85       (2)
CHF$L_SIG_ARG1                    00000008      85       (2)
CHF$L_SIG_ARGS                    00000000      85       (2)
CHF$L_SIG_NAME                    00000004      85       (2)
CHI$M_CHNINT                     =00000001      84       (2)
CHI$M_DEVINT                     =00000002      84       (2)
CHI$M_IPL                        =0000007C      84       (2)
CHI$S_IPL                        =00000005      84       (2)
CHI$V_CHNINT                     =00000000      84       (2)
CHI$V_DEVINT                     =00000001      84       (2)
CHI$V_IPL                        =00000002      84       (2)
CHM$_FORWARD                     =00000000      84       (2)        84       (2)
CHM$_INVALIDATE                  =00000001      84       (2)        84       (2)
CHM$_MAP                         =00000002      84       (2)        84       (2)
CHM$_MFWDN                       =00000002      84       (2)
CHM$_MFWDNO                      =0000000A      84       (2)
CHM$_MFWDV                       =00000003      84       (2)
CHM$_MFWDVO                      =0000000B      84       (2)
CHM$_MREVN                       =00000006      84       (2)
CHM$_MREVNO                      =0000000E      84       (2)
CHM$_MREVV                       =00000007      84       (2)
CHM$_MREVVO                      =0000000F      84       (2)
CHM$_NFWDN                       =00000000      84       (2)
CHM$_NREVN                       =00000004      84       (2)
CHM$_OFFSET                      =00000008      84       (2)        84       (2)
CHM$_REVERSE                     =00000004      84       (2)        84       (2)
CHS$M_BUSIC                      =00800000      84       (2)
CHS$M_BUSINIT                    =00400000      84       (2)
CHS$M_BUSNXM                     =08000000      84       (2)
CHS$M_BUSPDN                     =01000000      84       (2)
CHS$M_CHNDPE                     =00000040      84       (2)
CHS$M_CHNERR                     =00000002      84       (2)        84       (2)
CHS$M_CHNMPE                     =00000080      84       (2)
CHS$M_CHPFOT                     =00000100      84       (2)
CHS$M_DEVBUS                     =00000010      84       (2)
CHS$M_DEVERR                     =00000004      84       (2)        84       (2)
CHS$M_DEVTO                      =00000020      84       (2)
CHS$M_ERRANY                     =0000000F      84       (2)
CHS$M_MBAATN                     =00100000      84       (2)
CHS$M_MBACPE                     =00200000      84       (2)
CHS$M_MBADTB                     =00040000      84       (2)
CHS$M_MBADTC                     =00080000      84       (2)
CHS$M_MBAEXC                     =00010000      84       (2)
CHS$M_MBANED                     =00020000      84       (2)
CHS$M_MBAWCKLWR                  =02000000      84       (2)
CHS$M_MBAWCKUPR                  =04000000      84       (2)
CHS$M_PGMERR                     =00000008      84       (2)        84       (2)
CHS$M_PGMHDE                     =00000800      84       (2)
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CHS$M_SYSERR                   =00000001      84      (2)      84      (2)
CHS$M_SYSMEM                   =00000200      84      (2)
CHS$M_SYSSBI                   =00000400      84      (2)
CHS$V_BUSIC                    =00000017      84      (2)
CHS$V_BUSINIT                  =00000016      84      (2)
CHS$V_BUSNXM                   =0000001B      84      (2)
CHS$V_BUSPDN                   =00000018      84      (2)
CHS$V_CHNDPE                   =00000006      84      (2)
CHS$V_CHNERR                   =00000001      84      (2)
CHS$V_CHNMPE                   =00000007      84      (2)
CHS$V_CHPFOT                   =00000008      84      (2)
CHS$V_DEVBUS                   =00000004      84      (2)
CHS$V_DEVERR                   =00000002      84      (2)
CHS$V_DEVTO                    =00000005      84      (2)
CHS$V_MBAATN                   =00000014      84      (2)
CHS$V_MBACPE                   =00000015      84      (2)
CHS$V_MBADTB                   =00000012      84      (2)
CHS$V_MBADTC                   =00000013      84      (2)
CHS$V_MBAEXC                   =00000010      84      (2)
CHS$V_MBANED                   =00000011      84      (2)
CHS$V_MBAWCKLWR                =00000019      84      (2)
CHS$V_MBAWCKUPR                =0000001A      84      (2)
CHS$V_PGMERR                   =00000003      84      (2)
CHS$V_PGMHDE                   =0000000B      84      (2)
CHS$V_SYSERR                   =00000000      84      (2)
CHS$V_SYSMEM                   =00000009      84      (2)
CHS$V_SYSSBI                   =0000000A      84      (2)
CLEAN_UP                        00000000-R    495     (8)      212     (3)
CLEAN_UP_X                      000000EB-R    520     (8)
CPU$V_COMET                    =00000002      80      (2)
CPU$V_HS                       =00000000      80      (2)
CPU$V_STAR                     =00000001      80      (2)
DEFAULT                        =00000000      303     (5)
DEV_REG                         00000000-R    250     (4)      212     (3)
DISPATCH                        00000000-R    225     (3)      212     (3)
DS$ABORT                        00010020      79      (2)      376     (7)      511     (8)
DS$ASKADR                       00010090      79      (2)
DS$ASKDATA                      00010080      79      (2)
DS$ASKLGCL                      00010098      79      (2)
DS$ASKSTR                       000100A0      79      (2)
DS$ASKVLD                       00010088      79      (2)
DS$ATTACH                       000101A8      79      (2)
DS$BGNSUB                       00010030      79      (2)
DS$BRANCH                       000100A8      79      (2)      387     (7)      635     (12)
DS$BREAK                        00010058      79      (2)      458     (7)      520     (8)      593     (10)
DS$CANWAIT                      00010070      79      (2)
DS$CHANNEL                      00010180      79      (2)
DS$CKLOOP                       00010040      79      (2)
DS$CLRVEC                       00010168      79      (2)      496     (8)      497     (8)      498     (8)      499     (8)
                                                               500     (8)      501     (8)      502     (8)      503     (8)
                                                               504     (8)      505     (8)      506     (8)      507     (8)
                                                               508     (8)
DS$CNTRLC                       00010078      79      (2)
DS$CVTREG                       000100B0      79      (2)
DS$ENDPASS                      00010010      79      (2)      457     (7)
DS$ENDSUB                       00010038      79      (2)
DS$ERRDEV                       000100C8      79      (2)
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DS$ERRHARD                      000100D0      79     (2)
DS$ERRPREP                      00010108      79     (2)
DS$ERRSOFT                      000100D8      79     (2)
DS$ERRSYS                       000100C0      79     (2)      636    (12)
DS$ESCAPE                       00010050      79     (2)
DS$FREEDBGSYM                   000101B8      79     (2)
DS$GETBUF                       00010120      79     (2)      434    (7)      446    (7)      447    (7)      448    (7)
                                                              449    (7)      450    (7)      451    (7)      452    (7)
                                                              453    (7)      454    (7)      634    (12)
DS$GETMEM                       00010130      79     (2)
DS$GPHARD                       00010018      79     (2)      386    (7)
DS$HELP                         000101B0      79     (2)
DS$INITSCB                      00010170      79     (2)      512    (8)
DS$INLOOP                       00010048      79     (2)
DS$K_BBC                       =0000001D      88     (2)
DS$K_BBCC                      =00000021      88     (2)
DS$K_BBCCI                     =00000023      88     (2)
DS$K_BBCS                      =0000001F      88     (2)
DS$K_BBS                       =0000001C      88     (2)
DS$K_BBSC                      =00000020      88     (2)
DS$K_BBSS                      =0000001E      88     (2)
DS$K_BBSSI                     =00000022      88     (2)
DS$K_BCC_M                     =0000001B      88     (2)
DS$K_BCS_M                     =0000001A      88     (2)
DS$K_BEQLU_B                   =00000005      88     (2)
DS$K_BEQLU_M                   =00000011      88     (2)
DS$K_BEQL_B                    =00000004      88     (2)
DS$K_BEQL_M                    =00000010      88     (2)
DS$K_BERROR                    =00000026      88     (2)
DS$K_BGEQU_B                   =00000007      88     (2)
DS$K_BGEQU_M                   =00000013      88     (2)
DS$K_BGEQ_B                    =00000006      88     (2)
DS$K_BGEQ_M                    =00000012      88     (2)
DS$K_BGTRU_B                   =00000009      88     (2)
DS$K_BGTRU_M                   =00000015      88     (2)
DS$K_BGTR_B                    =00000008      88     (2)
DS$K_BGTR_M                    =00000014      88     (2)
DS$K_BLBC                      =00000025      88     (2)
DS$K_BLBS                      =00000024      88     (2)
DS$K_BLEQU_B                   =00000003      88     (2)
DS$K_BLEQU_M                   =0000000F      88     (2)
DS$K_BLEQ_B                    =00000002      88     (2)
DS$K_BLEQ_M                    =0000000E      88     (2)
DS$K_BLSSU_B                   =00000001      88     (2)
DS$K_BLSSU_M                   =0000000D      88     (2)
DS$K_BLSS_B                    =00000000      88     (2)
DS$K_BLSS_M                    =0000000C      88     (2)
DS$K_BNEQU_B                   =0000000B      88     (2)
DS$K_BNEQU_M                   =00000017      88     (2)
DS$K_BNEQ_B                    =0000000A      88     (2)
DS$K_BNEQ_M                    =00000016      88     (2)
DS$K_BNERROR                   =00000027      88     (2)    #-387    (7)    #-635    (12)
DS$K_BVC_M                     =00000019      88     (2)
DS$K_BVS_M                     =00000018      88     (2)
DS$K_ERROR                     =00000002      78     (2)
DS$K_NORMAL                    =00000001      78     (2)
DS$K_SEVERE                    =00000004      78     (2)
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DS$K_SUBSYS                   =00000066     78      (2)      78      (2)
DS$K_WARNING                  =00000000     78      (2)
DS$LOAD                        00010198     79      (2)
DS$LOADPCS                     000101C0     79      (2)
DS$MAPDBGBLOCK                 00010118     79      (2)
DS$MMOFF                       00010158     79      (2)     373      (7)      509     (8)
DS$MMON                        00010150     79      (2)
DS$MOVPHY                      00010148     79      (2)
DS$MOVVRT                      00010140     79      (2)
DS$PARSE                       000100B8     79      (2)
DS$PRINTB                      000100E0     79      (2)
DS$PRINTF                      000100F0     79      (2)     375      (7)
DS$PRINTS                      000100F8     79      (2)     588      (10)
DS$PRINTSIG                    00010100     79      (2)
DS$PRINTX                      000100E8     79      (2)
DS$PROBE                       000101A0     79      (2)
DS$RELBUF                      00010128     79      (2)     442      (7)      514     (8)      515     (8)
DS$RELMEM                      00010138     79      (2)
DS$SETIPL                      00010178     79      (2)     518      (8)
DS$SETMAP                      00010188     79      (2)
DS$SETPRIEXV                   00010110     79      (2)
DS$SETVEC                      00010160     79      (2)
DS$SHOCHAN                     00010190     79      (2)
DS$SUMMARY                     00010028     79      (2)
DS$WAITMS                      00010060     79      (2)
DS$WAITUS                      00010068     79      (2)
DS$_ARITH                     =006600D0     78      (2)
DS$_BADLINK                   =006600F0     78      (2)
DS$_BADTYPE                   =006600E8     78      (2)
DS$_CHME                      =006600A8     78      (2)
DS$_CHMK                      =006600E0     78      (2)
DS$_DEVNAME                   =00660108     78      (2)
DS$_ERROR                     =00660002     78      (2)
DS$_FHWE                      =00660068     78      (2)
DS$_FRAGBUF                   =00660080     78      (2)
DS$_ICBUSY                    =006600C8     78      (2)
DS$_ICERR                     =006600C0     78      (2)
DS$_IHWE                      =00660060     78      (2)
DS$_ILLCHAR                   =00660018     78      (2)
DS$_ILLPAGCNT                 =00660078     78      (2)
DS$_ILLUNIT                   =00660100     78      (2)
DS$_INSFMEM                   =00660050     78      (2)
DS$_IPL2HI                    =006600B8     78      (2)
DS$_IVADDR                    =00660040     78      (2)
DS$_IVVECT                    =00660038     78      (2)
DS$_KRNLSTK                   =00660090     78      (2)
DS$_LOGIC                     =00660070     78      (2)
DS$_MCHK                      =00660088     78      (2)
DS$_MMOFF                     =00660058     78      (2)
DS$_NEEDUNIT                  =006600F8     78      (2)
DS$_NOPCS                     =00660110     78      (2)
DS$_NORMAL                    =00660001     78      (2)
DS$_NOSUPPORT                 =006600B1     78      (2)
DS$_NOTDON                    =00660030     78      (2)
DS$_NOTIMP                    =006600B0     78      (2)      78      (2)
DS$_NULLSTR                   =00660010     78      (2)
DS$_OVERFLOW                  =00660008     78      (2)
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DS$_POWER                       =00660098      78      (2)
DS$_PROGERR                     =00660020      78      (2)
DS$_SEVERE                      =00660004      78      (2)
DS$_TRANSL                      =006600A0      78      (2)
DS$_TRUNCATE                    =00660028      78      (2)
DS$_UNEXPINT                    =006600D8      78      (2)
DS$_VASFULL                     =00660048      78      (2)
DS$_WARNING                     =00660000      78      (2)        78      (2)
DSA$AL_APTMAIL                   0000FE00      80      (2)
DSA$AT_APTTXT                    0000FA00      80      (2)
DSA$GL_APTCOM                    0000FE04      80      (2)
DSA$GL_DEVLEN                    0000FE58      80      (2)
DSA$GL_ERRNO                     0000FE44      80      (2)
DSA$GL_EVENT                     0000FE48      80      (2)
DSA$GL_FLAGS                     0000FE00      80      (2)       370      (7)
DSA$GL_MSGTYP                    0000FE40      80      (2)
DSA$GL_PASSES                    0000FE08      80      (2)
DSA$GL_PASSNO                    0000FE54      80      (2)
DSA$GL_SECTNO                    0000FE10      80      (2)
DSA$GL_SID                       0000FE14      80      (2)
DSA$GL_SUBTNO                    0000FE4C      80      (2)
DSA$GL_TESTNO                    0000FE50      80      (2)      #-684     (14)
DSA$GL_UNITS                     0000FE0C      80      (2)
DSA$GQ_MSGPTR                    0000FE68      80      (2)
DSA$GT_DEVNAM                    0000FE5C      80      (2)
DSA$M_APT                       =80000000      80      (2)
DSA$M_BELL                      =00000008      80      (2)
DSA$M_BINARY                    =00000002      80      (2)
DSA$M_CRD_AUTOTEST              =00000800      80      (2)
DSA$M_CRD_MENUTEST              =00010000      80      (2)
DSA$M_CRD_TRACE                 =00020000      80      (2)
DSA$M_DEBUG                     =04000000      80      (2)
DSA$M_HALT                      =00000001      80      (2)
DSA$M_IE1                       =00000010      80      (2)
DSA$M_IE2                       =00000020      80      (2)
DSA$M_IE3                       =00000040      80      (2)
DSA$M_IES                       =00000080      80      (2)
DSA$M_LOAD_DEBUGGER             =40000000      80      (2)
DSA$M_LOOP                      =00000004      80      (2)
DSA$M_NORPT                     =08000000      80      (2)
DSA$M_OPER                      =00001000      80      (2)
DSA$M_PASS0                     =20000000      80      (2)
DSA$M_PROMPT                    =00002000      80      (2)
DSA$M_QA                        =00008000      80      (2)
DSA$M_QUICK                     =00000100      80      (2)
DSA$M_SEARCH                    =00004000      80      (2)
DSA$M_TRACE                     =00000400      80      (2)
DSA$M_USER                      =10000000      80      (2)
DSA$M_VERIFY                    =00000200      80      (2)
DSA$V_APT                       =0000001F      80      (2)
DSA$V_BELL                      =00000003      80      (2)
DSA$V_BINARY                    =00000001      80      (2)
DSA$V_CRD_AUTOTEST              =0000000B      80      (2)
DSA$V_CRD_MENUTEST              =00000010      80      (2)
DSA$V_CRD_TRACE                 =00000011      80      (2)
DSA$V_DEBUG                     =0000001A      80      (2)
DSA$V_HALT                      =00000000      80      (2)
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DSA$V_IE1                        =00000004    80      (2)
DSA$V_IE2                        =00000005    80      (2)
DSA$V_IE3                        =00000006    80      (2)
DSA$V_IES                        =00000007    80      (2)
DSA$V_LOAD_DEBUGGER              =0000001E    80      (2)
DSA$V_LOOP                       =00000002    80      (2)
DSA$V_NORPT                      =0000001B    80      (2)
DSA$V_OPER                       =0000000C    80      (2)
DSA$V_PASSO                      =0000001D    80      (2)    #-370     (7)
DSA$V_PROMPT                     =0000000D    80      (2)
DSA$V_QA                         =0000000F    80      (2)
DSA$V_QUICK                      =00000008    80      (2)
DSA$V_SEARCH                     =0000000E    80      (2)
DSA$V_TRACE                      =0000000A    80      (2)
DSA$V_USER                       =0000001C    80      (2)
DSA$V_VERIFY                     =00000009    80      (2)
ENV$M_DOMAIN                     =00000002    66      (2)
ENV$M_LEVEL                      =00000001    66      (2)
ENV$M_SUPER                      =000003FC    66      (2)
ENV$S_DOMAIN                     =00000001    66      (2)
ENV$S_LEVEL                      =00000001    66      (2)
ENV$S_SUPER                      =00000008    66      (2)
ENV$V_DOMAIN                     =00000001    66      (2)      66      (2)
ENV$V_LEVEL                      =00000000    66      (2)      66      (2)
ENV$V_SUPER                      =00000002    66      (2)     212      (3)
ENV$_CPU                         =00000000    66      (2)      66      (2)
ENV$_FUNCTIONAL                  =00000000    66      (2)      66      (2)
ENV$_REPAIR                      =00000001    66      (2)      66      (2)
ENV$_SUPER                       =00000001    66      (2)     212      (3)
ENV$_SYSTEM                      =00000001    66      (2)      66      (2)
FMT_SUMMARY                       000000BE-R  328     (5)     588      (10)
GPR_TABLE                         00000095-R  138     (2)
HALT                             =00000004    303     (5)
HARDCNT                           00000000-R  256     (4)    #-368     (7)      #-687     (14)    #-689     (14)
HP$A_DEPENDENT                    00000032    86      (2)      87      (2)
HP$A_DEVICE                       00000018    86      (2)
HP$A_DVA                          0000001C    86      (2)
HP$A_LINK                         00000020    86      (2)
HP$B_DRIVE                        0000000B    86      (2)    #-393     (7)      #-420     (7)
HP$B_FLAGS                        0000000A    86      (2)
HP$KA_L_FLAGS                    =0000000C    103     (2)    #-412     (7)
HP$KA_MEM_SIZE                   =00000044    104     (2)    #-413     (7)
HP$M_ALLOC                       =00000001    86      (2)
HP$M_WASALL                      =00000002    86      (2)
HP$Q_DEVICE                       00000000    86      (2)
HP$T_DEVICE                       0000000C    86      (2)
HP$T_TYPE                         00000026    86      (2)    #-390     (7)      #-406     (7)     #-408     (7)     #-415     (7)
                                                             #-417     (7)
HP$V_ALLOC                       =00000000    86      (2)
HP$V_WASALL                      =00000001    86      (2)
HP$W_SIZE                         00000008    86      (2)
HP$W_VECTOR                       00000024    86      (2)
INITIALIZE                        00000000-R  367     (7)     212      (3)
INITIALIZE_X                      00000262-R  458     (7)
IPR                              =00000006    303     (5)
KA$B_ACC_TYPE                     00000042    87      (2)
KA$B_SID_TYPE                     0000003D    87      (2)
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KA$K_LEN                         00000043     87      (2)
KA$L_FLAGS                       00000032     87      (2)
KA$L_SID                         0000003A     87      (2)
KA$M_CHAR                       =00000100     87      (2)
KA$M_CRC                        =00000010     87      (2)
KA$M_D_FLOAT                    =00000002     87      (2)
KA$M_EDIT                       =00000080     87      (2)
KA$M_F_FLOAT                    =00000001     87      (2)
KA$M_G_FLOAT                    =00000004     87      (2)
KA$M_H_FLOAT                    =00000008     87      (2)
KA$M_PACKED                     =00000020     87      (2)
KA$M_PACK_MUL                   =00000040     87      (2)
KA$M_TODR                       =00010000     87      (2)
KA$V_CHAR                       =00000008     87      (2)
KA$V_CRC                        =00000004     87      (2)
KA$V_D_FLOAT                    =00000001     87      (2)
KA$V_EDIT                       =00000007     87      (2)
KA$V_F_FLOAT                    =00000000     87      (2)
KA$V_G_FLOAT                    =00000002     87      (2)
KA$V_H_FLOAT                    =00000003     87      (2)
KA$V_PACKED                     =00000005     87      (2)
KA$V_PACK_MUL                   =00000006     87      (2)
KA$V_TODR                       =00000010     87      (2)
KA$W_LATENCY                     0000003E     87      (2)
KA$W_PROGRESS                    00000040     87      (2)
KA$W_RESERVED                    00000038     87      (2)
KA$W_WCS                         00000036     87      (2)
KA730                           =00000001     311     (5)
KA730_REV_54                    =03003600     89      (2)
KA_PTABLE                        0000018B-R   238     (3)      #-382     (7)     #-411     (7)
KA_UNIT_NO                       00000071-R   128     (2)      #-410     (7)
L$A_CCP                          00000040-R   212     (3)
L$A_DEVP                         0000001C-R   212     (3)
L$A_DREG                         00000024-R   212     (3)
L$A_DTP                          00000018-R   212     (3)
L$A_ICP                          0000003C-R   212     (3)
L$A_LASTAD                       00000014-R   212     (3)
L$A_NAME                         00000008-R   212     (3)
L$A_REPP                         00000044-R   212     (3)
L$A_SECNAM                       00000050-R   212     (3)
L$A_STATAB                       00000048-R   212     (3)
L$A_TSTCNT                       00000054-R   212     (3)      #-591     (10)    #-630     (12)
L$L_ENVIRON                      00000004-R   212     (3)
L$L_ERRTYP                       0000004C-R   212     (3)
L$L_HEADLENGTH                   00000000-R   212     (3)
L$L_REV                          0000000C-R   212     (3)
L$L_UNIT                         00000020-R   212     (3)
L$L_UPDATE                       00000010-R   212     (3)
LASTAD                           00000000-R   212     (3)        212     (3)
LDPCTX                          =0000000B     303     (5)
L_ACT_ISP                        00000058-R   120     (2)
L_ACT_KSP                        00000054-R   119     (2)
L_ACT_PSL                        0000005C-R   121     (2)
L_ACT_SP                         00000050-R   118     (2)
L_EXP_AP                         000000C5-R   151     (2)
L_EXP_FP                         000000C9-R   152     (2)
L_EXP_ISP                        000000D5-R   155     (2)
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L_EXP_KSP                        000000D1-R    154     (2)
L_EXP_PSL                        000000D9-R    156     (2)
L_EXP_SP                         000000CD-R    153     (2)
L_ISP                            00000064-R    123     (2)
L_KA_FLAGS                       0000008D-R    135     (2)      #-412      (7)
L_KSIZE_PTBL                     00000091-R    136     (2)      #-413      (7)
L_KSP                            00000060-R    122     (2)
L_LAST_UBE                       00000068-R    125     (2)      #-383      (7)       #-392      (7)
L_TSTCNT                         00000000-R    212     (3)        212      (3)
MANUAL                          =00000001      303     (5)
MCHK                            =00000005      303     (5)
MEM                             =00000009      303     (5)
MM_MSG                           000000EE-R    331     (5)        375      (7)
MODELIST                         00000156-R    184     (2)
M_DSABL_ECC                     =02000000      100     (2)      #-519      (8)
PAR$M_ATDEF                     =00000010      81      (2)
PAR$M_ATHI                      =00000008      81      (2)
PAR$M_ATLO                      =00000004      81      (2)
PAR$M_NODEF                     =00000002      81      (2)
PAR$V_ATDEF                     =00000004      81      (2)
PAR$V_ATHI                      =00000003      81      (2)
PAR$V_ATLO                      =00000002      81      (2)
PAR$V_NODEF                     =00000001      81      (2)
PAR$_BIN                        =00000002      81      (2)
PAR$_DEC                        =0000000A      81      (2)
PAR$_HEX                        =00000010      81      (2)
PAR$_NO                         =00000000      81      (2)
PAR$_OCT                        =00000008      81      (2)
PAR$_YES                        =00000001      81      (2)
PART_INIT                        0000018B-R    683     (14)
POWER                           =00000003      303     (5)
PR$S_SID_ECO                    =00000009      83      (2)
PR$S_SID_PL                     =00000003      83      (2)
PR$S_SID_SN                     =0000000C      83      (2)
PR$S_SID_TYPE                   =00000008      83      (2)
PR$V_SID_ECO                    =0000000F      83      (2)
PR$V_SID_PL                     =0000000C      83      (2)
PR$V_SID_SN                     =00000000      83      (2)
PR$V_SID_TYPE                   =00000018      83      (2)
PR$_ACCR                        =00000029      83      (2)
PR$_ACCS                        =00000028      83      (2)
PR$_ASTLVL                      =00000013      83      (2)
PR$_CADR                        =00000025      83      (2)
PR$_CAER                        =00000027      83      (2)
PR$_CMIERR                      =00000017      83      (2)
PR$_CRBT                        =00000043      83      (2)
PR$_CSRD                        =0000001D      83      (2)
PR$_CSRS                        =0000001C      83      (2)      #-516      (8)
PR$_CSTD                        =0000001F      83      (2)
PR$_CSTS                        =0000001E      83      (2)      #-517      (8)
PR$_CSWP                        =00000042      83      (2)
PR$_ESP                         =00000001      83      (2)
PR$_ICCS                        =00000018      83      (2)
PR$_ICR                         =0000001A      83      (2)
PR$_IPL                         =00000012      83      (2)
PR$_ISP                         =00000004      83      (2)
PR$_KSP                         =00000000      83      (2)
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PR$_MAPEN                       =00000038       83      (2)
PR$_MCESR                       =00000026       83      (2)
PR$_MCTL1                       =00000044       83      (2)
PR$_MCTL2                       =00000045       83      (2)
PR$_MDCR1                       =00000049       83      (2)
PR$_MEAR                        =00000048       83      (2)
PR$_MECCR                       =0000004B       83      (2)
PR$_MEDR                        =0000004A       83      (2)
PR$_MGEN                        =00000046       83      (2)
PR$_MTBER                       =00000047       83      (2)
PR$_NICR                        =00000019       83      (2)
PR$_P0BR                        =00000008       83      (2)
PR$_P0LR                        =00000009       83      (2)
PR$_P1BR                        =0000000A       83      (2)
PR$_P1LR                        =0000000B       83      (2)
PR$_PAMACC                      =00000040       83      (2)
PR$_PAMLOC                      =00000041       83      (2)
PR$_PCBB                        =00000010       83      (2)
PR$_PME                         =0000003D       83      (2)
PR$_RXCS                        =00000020       83      (2)
PR$_RXDB                        =00000021       83      (2)
PR$_SBIER                       =00000034       83      (2)
PR$_SBIFS                       =00000030       83      (2)
PR$_SBIMT                       =00000033       83      (2)
PR$_SBIQC                       =00000036       83      (2)
PR$_SBIS                        =00000031       83      (2)
PR$_SBISC                       =00000032       83      (2)
PR$_SBITA                       =00000035       83      (2)
PR$_SBR                         =0000000C       83      (2)
PR$_SCBB                        =00000011       83      (2)
PR$_SID                         =0000003E       83      (2)
PR$_SID_TYP730                  =00000003       83      (2)
PR$_SID_TYP750                  =00000002       83      (2)
PR$_SID_TYP780                  =00000001       83      (2)
PR$_SID_TYP7VV                  =00000004       83      (2)
PR$_SID_TYPMAX                  =00000004       83      (2)
PR$_SIRR                        =00000014       83      (2)
PR$_SISR                        =00000015       83      (2)
PR$_SLR                         =0000000D       83      (2)
PR$_SSP                         =00000002       83      (2)
PR$_TBCHK                       =0000003F       83      (2)
PR$_TBDR                        =00000024       83      (2)
PR$_TBIA                        =00000039       83      (2)
PR$_TBIS                        =0000003A       83      (2)
PR$_TODR                        =0000001B       83      (2)
PR$_TXCS                        =00000022       83      (2)
PR$_TXDB                        =00000023       83      (2)
PR$_UBRESET                     =00000037       83      (2)
PR$_USP                         =00000003       83      (2)
PR$_WCSA                        =0000002C       83      (2)
PR$_WCSD                        =0000002D       83      (2)
PSL$C_EXEC                      =00000001       82      (2)
PSL$C_KERNEL                    =00000000       82      (2)
PSL$C_SUPER                     =00000002       82      (2)
PSL$C_USER                      =00000003       82      (2)
PSL$K_EXEC                      =00000001       82      (2)
PSL$K_KERNEL                    =00000000       82      (2)
```

```
PSL$K_SUPER                     =00000002    82     (2)
PSL$K_USER                      =00000003    82     (2)
PSL$M_C                         =00000001    82     (2)
PSL$M_CBIT                      =00000001    82     (2)
PSL$M_CM                        =80000000    82     (2)       82      (2)
PSL$M_CURMOD                    =03000000    82     (2)
PSL$M_DV                        =00000080    82     (2)
PSL$M_FPD                       =08000000    82     (2)       82      (2)
PSL$M_FU                        =00000040    82     (2)
PSL$M_IPL                       =001F0000    82     (2)
PSL$M_IS                        =04000000    82     (2)
PSL$M_IV                        =00000020    82     (2)
PSL$M_N                         =00000008    82     (2)
PSL$M_NBIT                      =00000008    82     (2)
PSL$M_PRVMOD                    =00C00000    82     (2)
PSL$M_SAFBITS                   =000037FF    82     (2)
PSL$M_TBIT                      =00000010    82     (2)
PSL$M_TP                        =40000000    82     (2)       82      (2)
PSL$M_V                         =00000002    82     (2)
PSL$M_VBIT                      =00000002    82     (2)
PSL$M_Z                         =00000004    82     (2)
PSL$M_ZBIT                      =00000004    82     (2)
PSL$S_CURMOD                    =00000002    82     (2)
PSL$S_IPL                       =00000005    82     (2)
PSL$S_PRVMOD                    =00000002    82     (2)
PSL$V_C                         =00000000    82     (2)
PSL$V_CBIT                      =00000000    82     (2)
PSL$V_CM                        =0000001F    82     (2)
PSL$V_CURMOD                    =00000018    82     (2)
PSL$V_DV                        =00000007    82     (2)
PSL$V_FPD                       =0000001B    82     (2)
PSL$V_FU                        =00000006    82     (2)
PSL$V_IPL                       =00000010    82     (2)
PSL$V_IS                        =0000001A    82     (2)
PSL$V_IV                        =00000005    82     (2)
PSL$V_N                         =00000003    82     (2)
PSL$V_NBIT                      =00000003    82     (2)
PSL$V_PRVMOD                    =00000016    82     (2)
PSL$V_TBIT                      =00000004    82     (2)
PSL$V_TP                        =0000001E    82     (2)
PSL$V_V                         =00000001    82     (2)
PSL$V_VBIT                      =00000001    82     (2)
PSL$V_Z                         =00000002    82     (2)
PSL$V_ZBIT                      =00000002    82     (2)
QWD_TIME                         000000AB-R  317    (5)      584     (10)     #-588    (10)
Q_TEST_TIME                      00000004-R  258    (4)     #-694    (14)     #-696    (14)      697     (14)     #-698     (14)
                                                            #-700    (14)
REG_TABLE                        000000DD-R  160    (2)
SCB$L_ACCESS                     00000020    77     (2)
SCB$L_ARITH                      00000034    77     (2)
SCB$L_BREAK                      0000002C    77     (2)
SCB$L_CHME                       00000044    77     (2)     #-498    (8)
SCB$L_CHMK                       00000040    77     (2)     #-501    (8)
SCB$L_CHMS                       00000048    77     (2)     #-499    (8)
SCB$L_CHMU                       0000004C    77     (2)     #-500    (8)
SCB$L_COMPAT                     00000030    77     (2)
SCB$L_KNLSTK                     00000008    77     (2)
```

```
SCB$L_MACHCHK                   00000004     77      (2)     #-502      (8)
SCB$L_OPCCUS                    00000014     77      (2)     #-503      (8)
SCB$L_OPCDEC                    00000010     77      (2)     #-504      (8)
SCB$L_POWER                     0000000C     77      (2)     #-497      (8)
SCB$L_RADRMOD                   0000001C     77      (2)
SCB$L_ROPRAND                   00000018     77      (2)
SCB$L_RXDB                      000000F8     77      (2)
SCB$L_SFTLVL1                   00000084     77      (2)
SCB$L_SFTLVL10                  000000A8     77      (2)
SCB$L_SFTLVL11                  000000AC     77      (2)
SCB$L_SFTLVL12                  000000B0     77      (2)
SCB$L_SFTLVL13                  000000B4     77      (2)
SCB$L_SFTLVL14                  000000B8     77      (2)
SCB$L_SFTLVL15                  000000BC     77      (2)
SCB$L_SFTLVL2                   00000088     77      (2)
SCB$L_SFTLVL3                   0000008C     77      (2)
SCB$L_SFTLVL4                   00000090     77      (2)
SCB$L_SFTLVL5                   00000094     77      (2)
SCB$L_SFTLVL6                   00000098     77      (2)
SCB$L_SFTLVL7                   0000009C     77      (2)
SCB$L_SFTLVL8                   000000A0     77      (2)
SCB$L_SFTLVL9                   000000A4     77      (2)
SCB$L_TBIT                      00000028     77      (2)
SCB$L_TIMER                     000000C0     77      (2)     #-496      (8)
SCB$L_TRANSL                    00000024     77      (2)
SCB$L_TXDB                      000000FC     77      (2)
SCB$L_UBE_0                    =00000348     95      (2)     #-505      (8)
SCB$L_UBE_1                    =0000034C     96      (2)     #-506      (8)
SCB$L_UBE_2                    =00000350     97      (2)     #-507      (8)
SCB$L_UBE_3                    =00000354     98      (2)     #-508      (8)
SCB$L_ZERO                      00000000     77      (2)
SECTION                         00000057-R   303     (5)       212      (3)
SEP_FUNCTIONAL                 =00000002     66      (2)
SEP_REPAIR                     =00000003     66      (2)
SIZ...                         =00000001     87      (2)        66      (2)        80      (2)        81      (2)        82      (2)
                                                                84      (2)        86      (2)        87      (2)
SUMMARY                         00000000-R   575     (10)      212      (3)
SUMMARY_INIT                    0000012B-R   628     (12)      430      (7)
SUMMARY_X                       00000046-R   593     (10)
SUM_A_BLOCK                     0000000C-R   274     (4)     #-576      (10)      634      (12)     #-639      (12)     #-640      (12)
                                                             #-642      (12)     #-686      (14)
SUM_BLK_SIZE                    00000014-R   286     (4)     #-515      (8)      #-638      (12)
SUM_K_SIZE                      0000000C     282     (4)     #-589      (10)     #-631      (12)     #-685      (14)
SUM_L_HARDCNT                   00000000     280     (4)     #-579      (10)     #-588      (10)     #-688      (14)
SUM_Q_RUNTIME                   00000004     281     (4)       584      (10)     #-695      (14)     #-696      (14)     #-699      (14)
                                                             #-700      (14)
SYS$ALLOC                       00010238     79      (2)
SYS$ASCTIM                      00010248     79      (2)       584      (10)
SYS$ASSIGN                      00010250     79      (2)
SYS$BINTIM                      00010258     79      (2)
SYS$CANCEL                      00010260     79      (2)
SYS$CANTIM                      00010268     79      (2)
SYS$CLOSE                       000105B8     79      (2)
SYS$CLREF                       00010298     79      (2)
SYS$CONNECT                     000105C0     79      (2)
SYS$DALLOC                      000102D8     79      (2)
SYS$DASSGN                      000102E0     79      (2)
```

```
SYS$DISCONNECT                   000105D0      79      (2)
SYS$FAO                          00010350      79      (2)
SYS$FAOL                         00010358      79      (2)
SYS$GET                          00010580      79      (2)
SYS$GETCHN                       000104C8      79      (2)
SYS$GETTIM                       00010378      79      (2)        697     (14)
SYS$LKWSET                       000103A0      79      (2)
SYS$NUMTIM                       000103B8      79      (2)
SYS$OPEN                         00010608      79      (2)
SYS$QIO                          000103C8      79      (2)
SYS$QIOW                         00010200      79      (2)
SYS$READ                         00010590      79      (2)
SYS$READEF                       000103D0      79      (2)
SYS$SETAST                       000103F8      79      (2)
SYS$SETEF                        00010400      79      (2)
SYS$SETIMR                       00010420      79      (2)
SYS$SETPRI                       00010428      79      (2)
SYS$SETPRT                       00010430      79      (2)
SYS$SETRWM                       00010438      79      (2)
SYS$SETSWM                       00010448      79      (2)
SYS$ULKPAG                       00010460      79      (2)
SYS$ULWSET                       00010468      79      (2)
SYS$UNWIND                       00010470      79      (2)
SYS$WAITFR                       00010478      79      (2)
SYS$WFLAND                       00010488      79      (2)
SYS$WFLOR                        00010490      79      (2)
S_ALL                            00000044-R    303     (5)        303     (5)
S_DEFAULT                        00000018-R    303     (5)        303     (5)
S_HALT                           00000032-R    303     (5)        303     (5)
S_IPR                            0000003C-R    303     (5)        303     (5)
S_LDPCTX                         00000050-R    303     (5)        303     (5)
S_MANUAL                         00000020-R    303     (5)        303     (5)
S_MCHK                           00000037-R    303     (5)        303     (5)
S_MEM                            00000048-R    303     (5)        303     (5)
S_POWER                          0000002C-R    303     (5)        303     (5)
S_TU58                           00000027-R    303     (5)        303     (5)
S_UBI                            0000004C-R    303     (5)        303     (5)
S_WCS                            00000040-R    303     (5)        303     (5)
TU0_UNIT_NO                      00000075-R    129     (2)       #-424    (7)
TU1_UNIT_NO                      00000079-R    130     (2)       #-426    (7)
TU58                            =00000002      311     (5)
T_KA730                          0000008B-R    311     (5)        311     (5)       #-406     (7)       #-408     (7)
T_NAME                           00000058-R    212     (3)        212     (3)
T_TIME                           000000B3-R    321     (5)        319     (5)
T_TU58                           00000091-R    311     (5)        311     (5)       #-415     (7)       #-417     (7)
T_UBE                            00000096-R    311     (5)        311     (5)       #-390     (7)
UBE                             =00000003      311     (5)
UBI                             =0000000A      303     (5)
WCS                             =00000007      303     (5)
```

```
                                             +------------------------+
                                             ! Macros Cross Reference !
                                             +------------------------+
MACRO             SIZE          DEFINITION       REFERENCES...
------            ----          ----------       -------------
$ASCTIM_S         1             582    (10)      582    (10)
$CHFDEF           1             85     (2)       85     (2)
$D1_ABPROGRAM     1             376    (7)       376    (7)       511    (8)
$D1_ERR           1             636    (12)      636    (12)
$D1_ERR_S         1             636    (12)      636    (12)
$D1_PRINT_S       1             375    (7)       375    (7)       588    (10)
$D1_SEC           1             303    (5)       303    (5)
$DEF              1             88     (2)       280    (4)       281    (4)       282    (4)       77     (2)       79     (2)
                                                 80     (2)       85     (2)       86     (2)       87     (2)
$DEFEND           1             77     (2)       77     (2)       79     (2)       80     (2)       82     (2)       83     (2)
                                                 85     (2)       86     (2)       87     (2)
$DEFINI           1             77     (2)       77     (2)       79     (2)       80     (2)       82     (2)       83     (2)
                                                 85     (2)       86     (2)       87     (2)
$DS_ABORT         1             376    (7)       376    (7)       511    (8)
$DS_BGNCLEAN      1             495    (8)       495    (8)
$DS_BGNINIT       1             367    (7)       367    (7)
$DS_BGNMOD        1             66     (2)       66     (2)
$DS_BGNSUMMARY    1             575    (10)      575    (10)
$DS_BNCOMPLETE    1             435    (7)       435    (7)
$DS_BNERROR       1             387    (7)       387    (7)       635    (12)
$DS_BPASSO        1             370    (7)       370    (7)
$DS_BREAK         1             458    (7)       458    (7)       520    (8)       593    (10)
$DS_CHCDEF        1             84     (2)       84     (2)
$DS_CHDEF         1             84     (2)       84     (2)
$DS_CHIDEF        1             84     (2)       84     (2)
$DS_CHMDEF        2             84     (2)       84     (2)
$DS_CHSDEF        3             84     (2)       84     (2)
$DS_CLRVEC_S      1             496    (8)       496    (8)       497    (8)       498    (8)       499    (8)       500    (8)
                                                 501    (8)       502    (8)       503    (8)       504    (8)       505    (8)
                                                 506    (8)       507    (8)       508    (8)
$DS_DEVTYP        1             311    (5)       311    (5)
$DS_DISPATCH      1             225    (3)       225    (3)
$DS_DSADEF        1             80     (2)       80     (2)
$DS_DSBDEF        1             80     (2)
$DS_DSDEF         2             78     (2)       78     (2)
$DS_DSSDEF        1             79     (2)       79     (2)
$DS_ENDCLEAN      1             520    (8)       520    (8)
$DS_ENDINIT       1             458    (7)       458    (7)
$DS_ENDMOD        1             704    (14)      704    (14)
$DS_ENDPASS_G     1             457    (7)       457    (7)
$DS_ENDSUMMARY    1             593    (10)      593    (10)
$DS_ENVDEF        2             66     (2)       66     (2)
$DS_ERRSYS_S      1             636    (12)      636    (12)
$DS_GETBUF_S      1             434    (7)       434    (7)       446    (7)       447    (7)       448    (7)       449    (7)
                                                 450    (7)       451    (7)       452    (7)       453    (7)       454    (7)
                                                 634    (12)
$DS_GPHARD_S      1             386    (7)       386    (7)
$DS_HEADER        4             210    (3)       210    (3)
$DS_HPODEF        2             86     (2)       86     (2)
$DS_INITSCB_G     1             512    (8)       512    (8)
```

```
$DS_MMOFF_G       1             373    (7)       373    (7)       509    (8)
$DS_PARDEF        1             81     (2)       81     (2)
$DS_PRINTF_S      1             375    (7)       375    (7)
$DS_PRINTS_S      1             585    (10)      585    (10)
$DS_PSLDEF        1             82     (2)       82     (2)
$DS_QADEF         2             88     (2)       88     (2)
$DS_RELBUF_S      1             442    (7)       442    (7)       514    (8)       515    (8)
$DS_SCBDEF        1             77     (2)       77     (2)
$DS_SECTION       2             302    (5)       302    (5)
$DS_SETIPL_S      1             518    (8)       518    (8)
$EQU              1             88     (2)       66     (2)       78     (2)       81     (2)       82     (2)       83     (2)
                                                 84     (2)       88     (2)

$EQULS1           1             88     (2)       66     (2)       78     (2)       82     (2)       84     (2)       88     (2)
$EQULST           1             66     (2)       66     (2)       78     (2)       82     (2)       84     (2)       88     (2)
$GBLINI           2             66     (2)       66     (2)       77     (2)       78     (2)       79     (2)       80     (2)
                                                 81     (2)       82     (2)       83     (2)       84     (2)       85     (2)
                                                 86     (2)       87     (2)       88     (2)
$GETTIM_S         1             697    (14)      697    (14)
$HP_DEFDEF        1             86     (2)
$KADEF            1             87     (2)
$PRDEF            1             83     (2)       83     (2)
$PSLDEF           1             82     (2)       82     (2)
$PUSHADR          1             434    (7)       434    (7)       442    (7)       446    (7)       447    (7)       448    (7)
                                                 449    (7)       450    (7)       451    (7)       452    (7)       453    (7)
                                                 454    (7)       514    (8)       515    (8)       584    (10)      634    (12)
                                                 636    (12)      697    (14)
$VIELD            1             66     (2)       66     (2)       80     (2)       81     (2)       82     (2)       84     (2)
                                                 86     (2)       87     (2)
$VIELD1           1             88     (2)       66     (2)       80     (2)       81     (2)       82     (2)       84     (2)
                                                 86     (2)       87     (2)
KA_DEF            2             87     (2)       87     (2)

                                             +------------------------+
                                             ! Performance indicators !
                                             +------------------------+

Phase                    Page faults    CPU Time       Elapsed Time
-----                    -----------    --------       ------------
Initialization                    27    00:00:00.06    00:00:00.41
Command processing                22    00:00:00.20    00:00:00.68
Pass 1                           895    00:00:17.62    00:00:30.99
Symbol table sort                  0    00:00:01.02    00:00:01.61
Pass 2                           256    00:00:03.39    00:00:04.39
Symbol table output               89    00:00:00.55    00:00:00.63
Psect synopsis output              6    00:00:00.05    00:00:00.09
Cross-reference output           180    00:00:02.87    00:00:04.25
Assembler run totals            1479    00:00:25.77    00:00:43.06

The working set limit was 1000 pages.
108793 bytes (213 pages) of virtual memory were used to buffer the intermediate code.
There were 40 pages of symbol table space allocated to hold 712 non-local and 25 local symbols.
705 source lines were read in Pass 1, producing 55 object records in Pass 2.
155 pages of virtual memory were used to define 44 macros.
```

```
                                           +----------------------------+
                                           ! Macro library statistics !
                                           +----------------------------+
Macro library name                          Macros defined
--------------------                        --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                        1
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                     47
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                    11
TOTALS (all libraries)                               59

1082 GETS were required to define 59 macros.

There were no errors, warnings or information messages.

/LIS/CRO ENKAX1
```

Table of contents

```
    (1)        1         ENKAXA: RESERVED PROCESSOR REGISTERS
    (2)       58         DECLARATIONS
    (3)      104         Data Tables
    (4)      179         ERROR MESSAGES
    (5)      211         SUBROUTINES AND SERVICE ROUTINES
    (6)      225         TEST 1:  Reserved Processor Registers
    (7)      247         SUBTEST 1.1:  Reserved Processor Registe
    (8)      315         SUBTEST 1.2:  Read only Processor Regist
    (9)      385         SUBTEST 1.3:  Write Only Processor Regis
```

```
0000            .SBTTL  ENKAXA: RESERVED PROCESSOR REGISTERS
0000            .TITLE  ENKAXA  VAX-11/730 Specific CPU Cluster Exerciser
0000            .IDENT  /1-3/
0000
0000    ;
0000    ; Copyright (C) 1981
0000    ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000    ;
0000    ; This software is furnished  under a license for use only on a single
0000    ; computer  system and  may be  copied only with  the inclusion of the
0000    ; above copyright notice.  This software, or any other copies thereof,
0000    ; may not be provided or  otherwise made available to any other person
0000    ; except for use on such system and to one who agrees to these license
0000    ; terms.  Title to and  ownership of the  software  shall at all times
0000    ; remain in DEC.
0000    ;
0000    ; The information in this software is subject to change without notice
0000    ; and should  not be construed  as a commitment  by Digital  Equipment
0000    ; Corporation.
0000    ;
0000    ; DEC assumes  no  responsibility  for  the use or  reliability of its
0000    ; software on equipment which is not supplied by DEC.
0000    ;
0000
0000    ;++
0000    ; Facility:     VAX Architecture Diagnostic.
0000    ;
0000    ; Abstract:     This module tests that all processor register numbers not
0000    ;               implemented on the VAX-11/730 will cause a reseved operand
0000    ;               fault for a MTPR or MFPR instruction. Also internal processor
0000    ;               registers which are write and read only and specific to the
0000    ;               VAX-11/730 are checked to not cause reserved operand faults,
0000    ;               except in the cases where they should fault.
0000    ;
0000    ;
0000    ; Environment:  VAX Diagnostic Supervisor.
0000    ;
0000    ; Author:       Rich Lewis      7-Jly-81        Version 1.0
0000    ;
0000    ;               Tai-Chun Pan    01-Apr-83       Version 1.2
0000    ;
0000    ;               Added quick flag on Test 7(TU58). If quick flag is set
0000    ;               will skip subtest 4 through subtest 11.  Added event flag 3.
0000    ;               If event flag 3 is set, will override protection,
0000    ;               i.e., go ahead and write on tape.  If run APT & event flag 3
0000    ;               is clear & tape is not scratch, will report an error.
0000    ;               Modified Unibus sizer on Test 8 & 9. make test run faster.
0000    ;
0000    ;
0000    ;               Tai-Chun Pan    03-Aug-83       Version 1.3
0000    ;
0000    ;               fixed bugs on TEST 7 and error summary routine call when
0000    ;               running under APT.
0000    ;
0000    ;
0000    ;--
```

```
                             0000     58              .SBTTL  DECLARATIONS
                             0000     59              .LIST   MEB
                             0000     60              .NLIST  CND
                         00000000     61              .PSECT  ENKAXA, PAGE, NOWRT
                             0000     62              .LIBRARY        "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                             0000     63              $DS_BGNMOD      CEP_REPAIR, TN=1
                             0000        ;;;          Macro-32 Diagnostic macro library Version 6.10 "DIAG.MLB (137)"
                             0000     64
                             0000     65 ;
                             0000     66 ; Include files:
                             0000     67 ;
                             0000     68
                             0000     69              .LIBRARY        "ENKAX"                  ; CPU Cluster Exerciser library.
                             0000     70
                             0000     71
                             0000     72 ;
                             0000     73 ; Equated symbols:
                             0000     74 ;
                             0000     78
                             0000     79              $DS_SCBDEF
                             0000     80              $DS_DSDEF
                             0000     81              $DS_DSSDEF
                             0000     82              $DS_HPODEF
                             0000     83              KA_DEF
                             0000     84              $DS_ERRDEF
                             0000     85              ENKAX_SECDEF
                             0000     86
                             0000     87 ;
                             0000     88 ; Own storage:
                             0000     89 ;
                             0000     90
              00000004       0000     91 L_REG_ADD:          .BLKL           ; contains the register address
              00000005       0004     92 B_FLAGS:            .BLKB           ; contains the following flags
                             0005     93
              00000000       0005     94 V_NO_FAULT=0                        ; bit position - fault did not occur
              00000001       0005     95 M_NO_FAULT=1@0                      ; bit mask - expected fault did not occur
              00000001       0005     96 V_FAULT=1                           ; bit position - fault sucess flag
              00000002       0005     97 M_FAULT=1@1                         ; bit mask - fault sucess flag
                             0005     98
                             0005    102
```

```
                  0005    104           .SBTTL  Data Tables
                  0005    105
                  0005    106 ; This is a table that contains the unused internal processor register
                  0005    107 ; numbers. This table is terminated by a -1.
                  0005    108
         00000005 0005    109 ADDRESS_TABLE:  .LONG   ^X5
         00000006 0009    110                 .LONG   ^X6
         00000007 000D    111                 .LONG   ^X7
         0000000E 0011    112                 .LONG   ^XE
         0000000F 0015    113                 .LONG   ^XF
         00000016 0019    114                 .LONG   ^X16
         00000017 001D    115                 .LONG   ^X17
         00000029 0021    116                 .LONG   ^X29
         0000002A 0025    117                 .LONG   ^X2A
         0000002B 0029    118                 .LONG   ^X2B
         0000002C 002D    119                 .LONG   ^X2C
         0000002D 0031    120                 .LONG   ^X2D
         0000002E 0035    121                 .LONG   ^X2E
         0000002F 0039    122                 .LONG   ^X2F
         0000003B 003D    123                 .LONG   ^X3B
         0000003C 0041    124                 .LONG   ^X3C
         00000040 0045    125                 .LONG   ^X40
         00000080 0049    126                 .LONG   ^X80
         00000100 004D    127                 .LONG   ^X100
         00000200 0051    128                 .LONG   ^X200
         00000400 0055    129                 .LONG   ^X400
         00000800 0059    130                 .LONG   ^X800
         00001000 005D    131                 .LONG   ^X1000
         00002000 0061    132                 .LONG   ^X2000
         00004000 0065    133                 .LONG   ^X4000
         00008000 0069    134                 .LONG   ^X8000
         00010000 006D    135                 .LONG   ^X10000
         00020000 0071    136                 .LONG   ^X20000
         00040000 0075    137                 .LONG   ^X40000
         00080000 0079    138                 .LONG   ^X80000
         00100000 007D    139                 .LONG   ^X100000
         00200000 0081    140                 .LONG   ^X200000
         00400000 0085    141                 .LONG   ^X400000
         00800000 0089    142                 .LONG   ^X800000
         01000000 008D    143                 .LONG   ^X1000000
         02000000 0091    144                 .LONG   ^X2000000
         04000000 0095    145                 .LONG   ^X4000000
         08000000 0099    146                 .LONG   ^X8000000
         10000000 009D    147                 .LONG   ^X10000000
         20000000 00A1    148                 .LONG   ^X20000000
         40000000 00A5    149                 .LONG   ^X40000000
         80000000 00A9    150                 .LONG   ^X80000000
         FFFFFFFF 00AD    151                 .LONG   ^XFFFFFFFF
                  00B1    152
                  00B1    153
                  00B1    154 ; This is a table that contains the read only internal processor register
                  00B1    155 ; numbers. This table is terminated by a -1.
                  00B1    156
         0000001A 00B1    157 ADDRESS_TABLE1: .LONG   ^X1A
         0000001D 00B5    158                 .LONG   ^X1D
         00000021 00B9    159                 .LONG   ^X21
         00000031 00BD    160                 .LONG   ^X31
```

```
                         0000003E  00C1   161                      .LONG    ^X3E
                         FFFFFFFF  00C5   162                      .LONG    ^XFFFFFFFF
                                   00C9   163
                                   00C9   164
                                   00C9   165 ; This is a table that contains the write only internal processor register
                                   00C9   166 ; numbers. This table is terminated by a -1.
                                   00C9   167
                         00000014  00C9   168 ADDRESS_TABLE2: .LONG    ^X14
                         00000019  00CD   169                 .LONG    ^X19
                         0000001F  00D1   170                 .LONG    ^X1F
                         00000023  00D5   171                 .LONG    ^X23
                         00000036  00D9   172                 .LONG    ^X36
                         00000037  00DD   173                 .LONG    ^X37
                         0000003F  00E1   174                 .LONG    ^X3F
                         FFFFFFFF  00E5   175                 .LONG    ^XFFFFFFFF
                                   00E9   176
                                   00E9   177
```

```
                                      00E9   179          .SBTTL  ERROR MESSAGES
                                      00E9   180 ;-------------------------------------------------------------------------
                                      00E9   181 T_NO_KA730:
69 76 65 64 20 6F 4E 20 20 2F 21 00'  00E9   182          .ASCIC  "!/  No devices of type KA730 selected.  Exiting test.!/"
20 65 70 79 74 20 66 6F 20 73 65 63   00F5
74 63 65 6C 65 73 20 30 33 37 41 4B   0101
67 6E 69 74 69 78 45 20 20 2E 64 65   010D
               2F 21 2E 74 73 65 74 20   0119
                                  37  00E9
                                      0121   183 ;-------------------------------------------------------------------------
                                      0121   184 T_NO_FAULT_TO:
45 52 20 64 65 74 63 65 70 78 45 00'  0121   185          .ASCIC  "Expected RESERVED OPERAND FAULT did not occur during!/"-
41 52 45 50 4F 20 44 45 56 52 45 53   012D
64 69 64 20 54 4C 55 41 46 20 44 4E   0139
64 20 72 75 63 63 6F 20 74 6F 6E 20   0145
20 65 76 6F 6D 2F 21 67 6E 69 72 75   0151
61 67 65 6C 6C 69 20 6E 61 20 6F 74   015D
20 72 6F 73 73 65 63 6F 72 70 20 6C   0169
64 64 61 20 72 65 74 73 69 67 65 72   0175
                  2F 21 73 73 65 72   0181
                                  65  0121
                                      0187   186                  "move to an illegal processor register address!/"
                                      0187   187 ;-------------------------------------------------------------------------
                                      0187   188 T_FAULT_ERR_F:
20 64 65 74 63 65 70 78 65 6E 55 00'  0187   189          .ASCIC  "Unexpected RESERVED OPERAND FAULT occured while attempting!/"-
45 50 4F 20 44 45 56 52 45 53 45 52   0193
6F 20 54 4C 55 41 46 20 44 4E 41 52   019F
65 6C 69 68 77 20 64 65 72 75 63 63   01AB
21 67 6E 69 74 70 6D 65 74 74 61 20   01B7
                                  2F  01C3
20 61 20 6E 6F 20 52 50 46 4D 20 61   01C4   190                  "a MFPR on a legal processor register address!/"
73 65 63 6F 72 70 20 6C 61 67 65 6C   01D0
72 65 74 73 69 67 65 72 20 72 6F 73   01DC
      2F 21 73 73 65 72 64 64 61 20   01E8
                                  6A  0187
                                      01F2   191 ;-------------------------------------------------------------------------
                                      01F2   192 T_NO_FAULT_FROM:
45 52 20 64 65 74 63 65 70 78 45 00'  01F2   193          .ASCIC  "Expected RESERVED OPERAND FAULT did not occur during!/"-
41 52 45 50 4F 20 44 45 56 52 45 53   01FE
64 69 64 20 54 4C 55 41 46 20 44 4E   020A
64 20 72 75 63 63 6F 20 74 6F 6E 20   0216
               2F 21 67 6E 69 72 75   0222
6E 61 20 6D 6F 72 66 20 65 76 6F 6D   0229   194                  "move from an illegal processor register address!/"
6F 72 70 20 6C 61 67 65 6C 6C 69 20   0235
73 69 67 65 72 20 72 6F 73 73 65 63   0241
21 73 73 65 72 64 64 61 20 72 65 74   024D
                                  2F  0259
                                  67  01F2
                                      025A   195 ;-------------------------------------------------------------------------
                                      025A   196 T_FAULT_ERR_T:
20 64 65 74 63 65 70 78 65 6E 55 00'  025A   197          .ASCIC  "Unexpected RESERVED OPERAND FAULT occured while attempting!/"-
45 50 4F 20 44 45 56 52 45 53 45 52   0266
6F 20 54 4C 55 41 46 20 44 4E 41 52   0272
65 6C 69 68 77 20 64 65 72 75 63 63   027E
21 67 6E 69 74 70 6D 65 74 74 61 20   028A
                                  2F  0296
20 61 20 6E 6F 20 52 50 54 4D 20 61   0297   198                  "a MTPR on a legal processor register address!/"
```

```
73 65 63 6F 72 70 20 6C 61 67 65 6C  02A3
72 65 74 73 69 67 65 72 20 72 6F 73  02AF
      2F 21 73 73 65 72 64 64 61 20  02BB
                                  6A  025A
                                      02C5    199 ;----------------------------------------------------------------------------
                                      02C5    200 T_REG_ADD:
41 20 72 65 74 73 69 67 65 52 20 00' 02C5    201           .ASCIC  '' Register Addressed  =   ^X  !XL    !/''
20 3D 20 20 64 65 73 73 65 72 64 64  02D1
20 20 20 4C 58 21 20 20 58 5E 20 20  02DD
                               2F 21  02E9
                                  25  02C5
                                      02EB    202 ;----------------------------------------------------------------------------
                                      02EB    203
                                      02EB    204 ERR_MESSAGE:
                                      02EB    205           $DS_BGNMESSAGE
                            0000      02EB                          .WORD     ^M<>                   ; ENTRY MASK
                                      02ED    206           $DS_PRINTB_S       FORMAT=@ERR$_P1(AP)
                   14 BC       9F     02ED                          PUSHAB    @ERR$_P1(AP)
          000100E0 9F    01    FB     02F0                          CALLS     #$$N, @#DS$PRINTB
                                      02F7    207           $DS_PRINTB_S       FORMAT=T_REG_ADD,P0=L_REG_ADD
                 FD05 CF       DD     02F7                          PUSHL     L_REG_ADD
                   C7 AF       9F     02FB                          PUSHAB    T_REG_ADD
          000100E0 9F    02    FB     02FE                          CALLS     #$$N, @#DS$PRINTB
                                      0305    208           $DS_ENDMESSAGE
                            04        0305                          RET                              ; RETURN TO DIAGNOSTIC SUPERVISOR
                                      0306    209
                            0306   211          .SBTTL SUBROUTINES AND SERVICE ROUTINES
                            0306   212
                            0306   213
                            0306   214 ; This routine will service all reserved operand faults.
                            0306   215
                            0306   216
                            0306   217          .ALIGN  LONG
                            0308   218 FAULT_SERVICE:
          6E     57     D0  0308   219          MOVL    R7,(SP)                 ; put return address on stack
     FCF4 CF     02     88  030B   220          BISB2   #M_FAULT,B_FLAGS        ; set the fault flag
                        02  0310   221          REI                             ; return
                            0311   222
                            0311   223          $DS_PAGE
```

```
                              0311                 .SBTTL  TEST 1:  Reserved Processor Registers
                          00000000                         .PSECT  TEST_001, PAGE, NOWRT
                              0020
                              0020      ;++
                              0020      ; Test description:
                              0020      ;
                              0020      ;          This test checks that processor numbers not used by the VAX-11/730
                              0020      ;          cause reserve operand faults for the MFPR and MTPR instructions.
                              0020      ;          All read only and write only registers are checked to cause a reserved
                              0020      ;          operand fault when the disallowed function is attempted. (i.e. - write
                              0020      ;          to a read only or read a write only)
                              0020      ;
                              0020      ;--
                              0020
                              0020                 $DS_BGNTEST       <IPR,ALL,DEFAULT>
                              0020      DATA_001:
                 00000000     0020                         .LONG   0                 ; TEST ARGUMENT TABLE TERMINATOR
                              0024      TEST_001::
                     0000     0024                         .WORD   ^M<>              ; ENTRY MASK
                              0026
       00000000'EF      D5    0026                 TSTL    KA_PTABLE                           ; CPU selected?
                10      18    002C                 BGEQ    5$                                  ; br = CPU selected
                              002E                 $DS_PRINTF_S      FORMAT=T_NO_KA730         ; print exit warning
       000000E9'EF      9F    002E                         PUSHAB  T_NO_KA730
   000100F0 9F      01  FB    0034                         CALLS   #$$N, @#DS$PRINTF
                              003B                 $DS_EXIT          TEST                      ; exit test
              0291      31    003B                         BRW     TEST_001_X        ; EXIT TEST 1
                              003E      5$:
                              003E
                              003E                 $DS_PAGE
```

```
                                     003E            .SBTTL  SUBTEST 1.1:  Reserved Processor Register Numbers
                                     003E    248 ;+
                                     003E    249 ; Subtest description:
                                     003E    250 ;
                                     003E    251 ;       This subtest checks all the reserved processor register numbers that
                                     003E    252 ;       are not used in the VAX-11/730 processor.
                                     003E    253 ;
                                     003E    254 ; Subtest steps:
                                     003E    255 ;
                                     003E    256 ;       SUBTEST RESERVED PROCESSOR REGISTER NUMBERS
                                     003E    257 ;       :  Initialize pointer to address table
                                     003E    258 ;       :  Get reserved operand fault vector to handle exception
                                     003E    259 ;       :  REPEAT
                                     003E    260 ;       :  :  Clear error flags
                                     003E    261 ;       :  :  Get address of register to attempt access
                                     003E    262 ;       :  :  Attempt MTPR on register
                                     003E    263 ;       :  :  Check for errors
                                     003E    264 ;       :  :  IF any errors
                                     003E    265 ;       :  :  :  THEN
                                     003E    266 ;       :  :  :  Report error
                                     003E    267 ;       :  :  :  Exit test
                                     003E    268 ;       :  :  ENDIF
                                     003E    269 ;       :  :  Attempt MFPR on register
                                     003E    270 ;       :  :  Check for errors
                                     003E    271 ;       :  :  IF any errors
                                     003E    272 ;       :  :  :  THEN
                                     003E    273 ;       :  :  :  Report error
                                     003E    274 ;       :  :  :  Exit test
                                     003E    275 ;       :  :  ENDIF
                                     003E    276 ;       :  : UNTIL All unused addresses done
                                     003E    277 ;       :  ENDREPEAT
                                     003E    278 ;       ENDSUBTEST RESERVED PROCESSOR REGISTER NUMBERS
                                     003E    279 ;
                                     003E    280 ;
                                     003E    281 ;-
                                     003E    282
                                     003E    283         $DS_BGNSUB
                                     003E        T1_S1::
    00010030 9F   00000000'EF   FA   003E                    CALLG   $S$, @#DS$BGNSUB
          53   00000005'EF   9E   0049    284         MOVAB   ADDRESS_TABLE,R3         ; load R3 with address of table
                                     0050    285         $DS_SETVEC_S    VECTOR=#SCB$L_ROPRAND   SRVADR=FAULT_SERVICE
                          00   DD   0050                    PUSHL   #0
               00000308'EF   DF   0052                    PUSHAL  FAULT_SERVICE
                          18   DD   0058                    PUSHL   #SCB$L_ROPRAND
           00010160 9F   03   FB   005A                    CALLS   #3, @#DS$SETVEC
          57   00000082'EF   9E   0061    286 NEXT:   MOVAB   RENTRY_1,R7               ; load R7 with address of rentry point
               00000004'EF   94   0068    287         CLRB    B_FLAGS                   ; initialize error flag
                     55   63   D0   006E    288         MOVL    (R3),R5                   ; load address of IPR to access
               00000000'EF   55   D0   0071    289         MOVL    R5,L_REG_ADD              ; save register address for error report
                     55   01   DA   0078    290         MTPR    #1,R5                     ; access IPR (should cause fault)
               00000004'EF   01   88   007B    291         BISB2   #M_NO_FAULT,B_FLAGS       ; flag no fault error
                                     0082    292 RENTRY_1:
       1D 00000004'EF   00   E1   0082    293         BBC     #V_NO_FAULT,B_FLAGS,3$   ; br = MTPR did cause fault
                                     008A    294         $DS_ERRHARD_S   UNIT=RA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_NO_FAULT_TO
               00000121'8F   DD   008A                    PUSHL   #T_NO_FAULT_TO
               000002EB'EF   DF   0090                    PUSHAL  ERR_MESSAGE
                          00   DD   0096                    PUSHL   #0
```

```
             00000000'EF   DD  0098                          PUSHL   KA_UNIT_NO
                      01   DD  009E                          PUSHL   #$ER
                               00A0        ;;; TEST 1, SUBTEST 1, ERROR 1
      000100D0 9F     05   FB  00A0                          CALLS   #$$M, @#DS$ERRHARD
                               00A7    295 3$:      $DS_CKLOOP       NEXT                   ; scope loop at NEXT
    00010040 9F    B7 AF   FA  00A7                          CALLG   NEXT, @#DS$CKLOOP
       57    000000C9'EF   9E  00AF    296 SCOPE:   MOVAB    RENTRY_2,R7                    ; load R7 with address of rentry point
             00000004'EF   94  00B6    297          CLRB     B_FLAGS                        ; initialize error flag
                   55 63   D0  00BC    298          MOVL     (R3),R5                        ; load address of IPR to access
                   56 55   DB  00BF    299          MFPR     R5,R6                          ; access IPR (should cause fault)
     00000004'EF      01   88  00C2    300          BISB2    #M_NO_FAULT,B_FLAGS            ; set no fault error flag
                               00C9    301 RENTRY_2:
  1D 00000004'EF      00   E1  00C9    302          BBC      #V_NO_FAULT,B_FLAGS,4$  ; br = MFPR did cause fault
                               00D1    303          $DS_ERRHARD_S    UNIT=KA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_NO_FAULT_FROM
             000001F2'8F   DD  00D1                          PUSHL   #T_NO_FAULT_FROM
             000002EB'EF   DF  00D7                          PUSHAL  ERR_MESSAGE
                      00   DD  00DD                          PUSHL   #0
             00000000'EF   DD  00DF                          PUSHL   KA_UNIT_NO
                      02   DD  00E5                          PUSHL   #$ER
                               00E7        ;;; TEST 1, SUBTEST 1, ERROR 2
      000100D0 9F     05   FB  00E7                          CALLS   #$$M, @#DS$ERRHARD
                               00EE    304 4$:      $DS_CKLOOP       SCOPE                  ; scope loop at SCOPE
    00010040 9F    BE AF   FA  00EE                          CALLG   SCOPE, @#DS$CKLOOP
                      83   D5  00F6    305 5$:      TSTL     (R3)+                          ; advance pointer
       63    FFFFFFFF 8F   D1  00F8    306          CMPL     #-1,(R3)                       ; check for end of table
                      03   13  00FF    307          BEQL     6$                             ; br = finished with all addresses
                    FF5D   31  0101    308          BRW      NEXT                           ; go do next address
                               0104    309 6$:      $DS_CLRVEC_S     VECTOR=#SCB$L_ROPRAND
                      18   DD  0104                          PUSHL   #SCB$L_ROPRAND
      00010168 9F     01   FB  0106                          CALLS   #1, @#DS$CLRVEC
                               010D    310
                               010D    311          $DS_ENDSUB
                               010D        T1_S1_X:
 00010038 9F    00000000'EF    FA  010D                          CALLG   $S$, @#DS$ENDSUB
                               0118    312
                               0118    313          $DS_PAGE
```

```
                                     0118          .SBTTL  SUBTEST 1.2:  Read only Processor Registers
                                     0118   316 ;+
                                     0118   317 ; Subtest description:
                                     0118   318 ;
                                     0118   319 ;      This subtest checks processor-specific registers which are read only
                                     0118   320 ;      registers. This subtest attempts a read and checks that a reserved
                                     0118   321 ;      operand fault does not occur.  Then an attempt to write the register
                                     0118   322 ;      is made which should cause a reserved operand fault. If an error is
                                     0118   323 ;      encountered it is reported.
                                     0118   324 ;
                                     0118   325 ;
                                     0118   326 ; Subtest steps:
                                     0118   327 ;
                                     0118   328 ;      SUBTEST READ ONLY PROCESSOR REGISTERS
                                     0118   329 ;      :  Get reserved operand fault vector to handle exception
                                     0118   330 ;      :  REPEAT
                                     0118   331 ;      :  :  Clear error flags
                                     0118   332 ;      :  :  Attempt MTPR on register
                                     0118   333 ;      :  :  Check for errors
                                     0118   334 ;      :  :  IF any errors
                                     0118   335 ;      :  :  :  THEN
                                     0118   336 ;      :  :  :  Report error
                                     0118   337 ;      :  :  :  Exit test
                                     0118   338 ;      :  :  ENDIF
                                     0118   339 ;      :  :  Attempt MFPR on register
                                     0118   340 ;      :  :  Check for errors
                                     0118   341 ;      :  :  IF any errors
                                     0118   342 ;      :  :  :  THEN
                                     0118   343 ;      :  :  :  Report error
                                     0118   344 ;      :  :  :  Exit test
                                     0118   345 ;      :  :  ENDIF
                                     0118   346 ;      :  : UNTIL all read only registers are done
                                     0118   347 ;      :  ENDREPEAT
                                     0118   348 ;      ENDSUBTEST READ ONLY PROCESSOR REGISTERS
                                     0118   349 ;
                                     0118   350 ;
                                     0118   351 ;
                                     0118   352 ;-
                                     0118   353            $DS_BGNSUB
                                     0118       T1_S2::
  00010030 9F    0000000C'EF    FA   0118                          CALLG   $S$, @#DS$BGNSUB
        53       000000B1'EF    9E   0123   354            MOVAB   ADDRESS_TABLE1,R3        ; load R3 with address of table
                                     012A   355            $DS_SETVEC_S    VECTOR=#SCB$L_ROPRAND   SRVADR=FAULT_SERVICE
                         00     DD   012A                          PUSHL   #0
               00000308'EF      DF   012C                          PUSHAL  FAULT_SERVICE
                         18     DD   0132                          PUSHL   #SCB$L_ROPRAND
        00010160 9F      03     FB   0134                          CALLS   #3, @#DS$SETVEC
        57     0000015C'EF      9E   013B   356 NEXT1:     MOVAB   RENTRY_3,R7                  ; load R7 with address of rentry point
               00000004'EF      94   0142   357            CLRB    B_FLAGS                      ; initialize error flag
                     55  63     D0   0148   358            MOVL    (R3),R5                      ; load address of IPR to access
        00000000'EF      55     D0   014B   359            MOVL    R5,L_REG_ADD                 ; load reg address for error
                     55  01     DA   0152   360            MTPR    #1,R5                        ; access IPR (should cause fault)
        00000004'EF      01     88   0155   361            BISB2   #M_NO_FAULT,B_FLAGS          ; set no fault error flag
                                     015C   362 RENTRY_3:
                                     015C   363            $DS_BREAK                            ; check for ^C
        00010058 9F      6E     FA   015C                          CALLG   (SP), @#DS$BREAK
     1D 00000004'EF      00     E1   0163   364            BBC     #V_NO_FAULT,B_FLAGS,3$   ; br = MTPR did cause fault
```

```
                                016B    365             $DS_ERRHARD_S   UNIT=KA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_NO_FAULT_TO
             00000121'8F    DD  016B                            PUSHL   #T_NO_FAULT_TO
             000002EB'EF    DF  0171                            PUSHAL  ERR_MESSAGE
                      00    DD  0177                            PUSHL   #0
             00000000'EF    DD  0179                            PUSHL   KA_UNIT_NO
                      01    DD  017F                            PUSHL   #$ER
                                0181            ;;; TEST 1, SUBTEST 2, ERROR 1
       000100D0 9F    05    FB  0181                            CALLS   #$$M, @#DS$ERRHARD
                                0188    366 3$:         $DS_CKLOOP      NEXT1                   ; scope loop at NEXT1
    00010040 9F    B0 AF    FA  0188                            CALLG   NEXT1, @#DS$CKLOOP
       57    000001A3'EF    9E  0190    367 SCOPE1: MOVAB       RENTRY_4,R7                     ; load R7 with address of rentry point
             00000004'EF    94  0197    368         CLRB        B_FLAGS                         ; initialize error flag
                   55 63    D0  019D    369         MOVL        (R3),R5                         ; load address of IPR to access
                   56 55    DB  01A0    370         MFPR        R5,R6                           ; access IPR (should not cause fault)
                                01A3    371 RENTRY_4:
                                01A3    372             $DS_BREAK                               ; check for ^C
       00010058 9F    6E    FA  01A3                            CALLG   (SP), @#DS$BREAK
    1D 00000004'EF    01    E1  01AA    373         BBC         #V_FAULT,B_FLAGS,4$             ; br = exception rountine executed
                                01B2    374         $DS_ERRHARD_S   UNIT=KA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_FAULT_ERR_F
             00000187'8F    DD  01B2                            PUSHL   #T_FAULT_ERR_F
             000002EB'EF    DF  01B8                            PUSHAL  ERR_MESSAGE
                      00    DD  01BE                            PUSHL   #0
             00000000'EF    DD  01C0                            PUSHL   KA_UNIT_NO
                      02    DD  01C6                            PUSHL   #$ER
                                01C8            ;;; TEST 1, SUBTEST 2, ERROR 2
       000100D0 9F    05    FB  01C8                            CALLS   #$$M, @#DS$ERRHARD
                                01CF    375 4$:         $DS_CKLOOP      SCOPE1                  ; scope loop at SCOPE1
    00010040 9F    BE AF    FA  01CF                            CALLG   SCOPE1, @#DS$CKLOOP
                      83    D5  01D7    376 5$:         TSTL    (R3)+                           ; advance pointer
       63     FFFFFFFF 8F   D1  01D9    377             CMPL    #-1,(R3)                        ; check for table terminator
                      03    13  01E0    378             BEQL    6$                              ; br = finished with all addresses
                    FF56    31  01E2    379             BRW     NEXT1                           ; go do next address
                                01E5    380 6$:         $DS_CLRVEC_S    VECTOR=#SCB$L_ROPRAND
                      18    DD  01E5                            PUSHL   #SCB$L_ROPRAND
       00010168 9F    01    FB  01E7                            CALLS   #1, @#DS$CLRVEC
                                01EE    381             $DS_ENDSUB
                                01EE            T1_S2_X:
  00010038 9F    0000000C'EF    FA  01EE                            CALLG   $S$, @#DS$ENDSUB
                                01F9    382
                                01F9    383             $DS_PAGE
```

```
                                   01F9               .SBTTL  SUBTEST 1.3:  Write Only Processor Registers
                                   01F9    386 ;+
                                   01F9    387 ; Subtest description:
                                   01F9    388 ;
                                   01F9    389 ;          This subtest checks processor-specific registers which are write only
                                   01F9    390 ;          registers.  This subtest attempts a write and checks that a reserved
                                   01F9    391 ;          operand fault does not occur. Then an attempt to read each read only
                                   01F9    392 ;          register is made which should cause a reserved operand fault. If an
                                   01F9    393 ;          error is encountered it is reported.
                                   01F9    394 ;
                                   01F9    395 ;
                                   01F9    396 ; Subtest steps:
                                   01F9    397 ;
                                   01F9    398 ;          SUBTEST WRITE ONLY PROCESSOR REGISTERS
                                   01F9    399 ;          :  Get reserved operand fault vector to handle exception
                                   01F9    400 ;          :  REPEAT
                                   01F9    401 ;          :  :  Clear error flags
                                   01F9    402 ;          :  :  Attempt MTPR on register
                                   01F9    403 ;          :  :  Check for errors
                                   01F9    404 ;          :  :  IF any errors
                                   01F9    405 ;          :  :  :  THEN
                                   01F9    406 ;          :  :  :  Report error
                                   01F9    407 ;          :  :  :  Exit test
                                   01F9    408 ;          :  :  ENDIF
                                   01F9    409 ;          :  :  Attempt MFPR on register
                                   01F9    410 ;          :  :  Check for errors
                                   01F9    411 ;          :  :  IF any errors
                                   01F9    412 ;          :  :  :  THEN
                                   01F9    413 ;          :  :  :  Report error
                                   01F9    414 ;          :  :  :  Exit test
                                   01F9    415 ;          :  :  ENDIF
                                   01F9    416 ;          :  : UNTIL all write only registers are done
                                   01F9    417 ;          :  ENDREPEAT
                                   01F9    418 ;          ENDSUBTEST WRITE ONLY PROCESSOR REGISTERS
                                   01F9    419 ;
                                   01F9    420 ;
                                   01F9    421 ;
                                   01F9    422 ;-
                                   01F9    423            $DS_BGNSUB
                                   01F9        T1_S3::
 00010030 9F     00000018'EF     FA  01F9                     CALLG    $S$, @#DS$BGNSUB
       53        000000C9'EF     9E  0204    424          MOVAB    ADDRESS_TABLE2,R3        ; load R3 with address of table
                                     020B    425          $DS_SETVEC_S      VECTOR=#SCB$L_ROPRAND   SRVADR=FAULT_SERVICE
                         00      DD  020B                     PUSHL    #0
              00000308'EF        DF  020D                     PUSHAL   FAULT_SERVICE
                         18      DD  0213                     PUSHL    #SCB$L_ROPRAND
        00010160 9F      03      FB  0215                     CALLS    #3, @#DS$SETVEC
       57     0000023D'EF        9E  021C    426 NEXT2:   MOVAB    RENTRY_5,R7                      ; load R7 with address of rentry point
              00000004'EF        94  0223    427          CLRB     B_FLAGS                          ; initialize error flag
                      55  63     D0  0229    428          MOVL     (R3),R5                          ; load address of IPR to access
              00000000'EF  55    D0  022C    429          MOVL     R5,L_REG_ADD                     ; load reg address for error
                      56  55     DB  0233    430          MFPR     R5,R6                            ; access IPR (should cause fault)
              00000004'EF  01    88  0236    431          BISB2    #M_NO_FAULT,B_FLAGS              ; set no fault error flag
                                     023D    432 RENTRY_5:
          1D 00000004'EF  00     E1  023D    433          BBC      #V_NO_FAULT,B_FLAGS,3$   ; br = MFPR did cause fault
                                     0245    434          $DS_ERRHARD_S    UNIT=RA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_NO_FAULT_TO
              00000121'8F        DD  0245                     PUSHL    #T_NO_FAULT_TO
          000002EB'EF    DF  024B                      PUSHAL  ERR_MESSAGE
                   00    DD  0251                      PUSHL   #0
          00000000'EF    DD  0253                      PUSHL   KA_UNIT_NO
                   01    DD  0259                      PUSHL   #$ER
                             025B      ;;; TEST 1, SUBTEST 3, ERROR 1
     000100D0 9F   05    FB  025B                      CALLS   #$$M, @#DS$ERRHARD
                             0262      3$:     $DS_CKLOOP      NEXT2             ; scope loop at NEXT2
 00010040 9F   B7 AF     FA  0262                      CALLG   NEXT2, @#DS$CKLOOP
   57   0000027D'EF      9E  026A      SCOPE2: MOVAB   RENTRY_6,R7               ; load R7 with address of rentry point
        00000004'EF      94  0271              CLRB    B_FLAGS                   ; initialize error flag
              55   63    D0  0277              MOVL    (R3),R5                   ; load address of IPR to access
              55   00    DA  027A              MTPR    #0,R5                     ; access IPR (should not cause fault)
                             027D      RENTRY_6:
   1D 00000004'EF  01    E1  027D              BBC     #V_FAULT,B_FLAGS,4$       ; br = no exception occured
                             0285              $DS_ERRHARD_S   UNIT=KA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_FAULT_ERR_T
          0000025A'8F    DD  0285                      PUSHL   #T_FAULT_ERR_T
          000002EB'EF    DF  028B                      PUSHAL  ERR_MESSAGE
                   00    DD  0291                      PUSHL   #0
          00000000'EF    DD  0293                      PUSHL   KA_UNIT_NO
                   02    DD  0299                      PUSHL   #$ER
                             029B      ;;; TEST 1, SUBTEST 3, ERROR 2
     000100D0 9F   05    FB  029B                      CALLS   #$$M, @#DS$ERRHARD
                             02A2      4$:     $DS_CKLOOP      SCOPE2            ; scope loop at SCOPE2
 00010040 9F   C5 AF     FA  02A2                      CALLG   SCOPE2, @#DS$CKLOOP
                   83    D5  02AA      5$:     TSTL    (R3)+                     ; advance pointer
   63    FFFFFFFF 8F     D1  02AC              CMPL    #-1,(R3)                  ; check for table terminator
                   03    13  02B3              BEQL    6$                        ; br = finished with all addresses
                 FF64    31  02B5              BRW     NEXT2                     ; go do next address
                             02B8      6$:     $DS_CLRVEC_S    VECTOR=#SCB$L_ROPRAND
                   18    DD  02B8                      PUSHL   #SCB$L_ROPRAND
     00010168 9F   01    FB  02BA                      CALLS   #1, @#DS$CLRVEC
                             02C1              $DS_ENDSUB
                             02C1      T1_S3_X:
00010038 9F   00000018'EF    FA  02C1                      CALLG   $S$, @#DS$ENDSUB
                             02CC
                             02CC              $DS_PAGE
              50   01    D0  02CC                      MOVL    #1, R0           ; NORMAL EXIT
                             02CF      TEST_001_X::
     00010058 9F   6E    FA  02CF                      CALLG   (SP), @#DS$BREAK
                        04   02D6                      RET                      ; RETURN TO TEST SEQUENCER
                     00000000                          .PSECT  $TSTCNT, NOEXE, NOWRT, OVR, LONG
             00000001    0000                          .LONG   $TN
                             0004              .END
```

```
$$$              = 00000018 R     06      DS$K_SEVERE      = 00000004     DS$_OVERFLOW     = 00660008
$$ARGS           = 0000000A               DS$K_SUBSYS      = 00000066     DS$_POWER        = 00660098
$$E              = 00000001               DS$K_WARNING     = 00000000     DS$_PROGERR      = 00660020
$$M              = 00000005               DS$LOAD            00010198     DS$_SEVERE       = 00660004
$$N              = 00000001               DS$LOADPCS         000101C0     DS$_TRANSL       = 006600A0
$$S              = FFFFFFFF               DS$MAPDBGBLOCK     00010118     DS$_TRUNCATE     = 00660028
$$T1             = 0000002C               DS$MMOFF           00010158     DS$_UNEXPINT     = 006600D8
$ENV             = 00000001   G           DS$MMON            00010150     DS$_VASFULL      = 00660048
$ER              = FFFFFFFF               DS$MOVPHY          00010148     DS$_WARNING      = 00660000
$MO              = 00000001   G           DS$MOVVRT          00010140     ENV$M_DOMAIN     = 00000002
$S$              = 00000018 R     06      DS$PARSE           000100B8     ENV$M_LEVEL      = 00000001
$ST              = 00000000               DS$PRINTB          000100E0     ENV$M_SUPER      = 000003FC
$TN              = 00000001               DS$PRINTF          000100F0     ENV$S_DOMAIN     = 00000001
ADDRESS_TABLE      00000005 R     02      DS$PRINTS          000100F8     ENV$S_LEVEL      = 00000001
ADDRESS_TABLE1     000000B1 R     02      DS$PRINTSIG        00010100     ENV$S_SUPER      = 00000008
ADDRESS_TABLE2     000000C9 R     02      DS$PRINTX          000100E8     ENV$V_DOMAIN     = 00000001
ALL              = 00000008   G           DS$PROBE           000101A0     ENV$V_LEVEL      = 00000000
BASE_001           00000000 R     04      DS$RELBUF          00010128     ENV$V_SUPER      = 00000002
BIT...           = 00000011               DS$RELMEM          00010138     ENV$_CPU         = 00000000
B_FLAGS            00000004 R     02      DS$SETIPL          00010178     ENV$_FUNCTIONAL= 00000000
CEP_FUNCTIONAL   = 00000000               DS$SETMAP          00010188     ENV$_REPAIR      = 00000001
CEP_REPAIR       = 00000001               DS$SETPRIEXV       00010110     ENV$_SUPER       = 00000001
DATA_001           00000020 R     04      DS$SETVEC          00010160     ENV$_SYSTEM      = 00000001
DEFAULT          = 00000000   G           DS$SHOCHAN         00010190     ERR$_MSGADR      = 0000000C
DS$ABORT           00010020               DS$SUMMARY         00010028     ERR$_NARGS       = 0000000A
DS$ASKADR          00010090               DS$WAITMS          00010060     ERR$_NUM         = 00000004
DS$ASKDATA         00010080               DS$WAITUS          00010068     ERR$_P1          = 00000014
DS$ASKLGCL         00010098               DS$_ARITH        = 006600D0     ERR$_P2          = 00000018
DS$ASKSTR          000100A0               DS$_BADLINK      = 006600F0     ERR$_P3          = 0000001C
DS$ASKVLD          00010088               DS$_BADTYPE      = 006600E8     ERR$_P4          = 00000020
DS$ATTACH          000101A8               DS$_CHME         = 006600A8     ERR$_P5          = 00000024
DS$BGNSUB          00010030               DS$_CHMK         = 006600E0     ERR$_P6          = 00000028
DS$BRANCH          000100A8               DS$_DEVNAME      = 00660108     ERR$_POINTER     = 00000010
DS$BREAK           00010058               DS$_ERROR        = 00660002     ERR$_UNIT        = 00000008
DS$CANWAIT         00010070               DS$_FHWE         = 00660068     ERR_MESSAGE        000002EB R     02
DS$CHANNEL         00010180               DS$_FRAGBUF      = 00660080     FAULT_SERVICE      00000308 R     02
DS$CKLOOP          00010040               DS$_ICBUSY       = 006600C8     HALT             = 00000004   G
DS$CLRVEC          00010168               DS$_ICERR        = 006600C0     HP$A_DEPENDENT     00000032
DS$CNTRLC          00010078               DS$_IHWE         = 00660060     HP$A_DEVICE        00000018
DS$CVTREG          000100B0               DS$_ILLCHAR      = 00660018     HP$A_DVA           0000001C
DS$ENDPASS         00010010               DS$_ILLPAGCNT    = 00660078     HP$A_LINK          00000020
DS$ENDSUB          00010038               DS$_ILLUNIT      = 00660100     HP$B_DRIVE         0000000B
DS$ERRDEV          000100C8               DS$_INSFMEM      = 00660050     HP$B_FLAGS         0000000A
DS$ERRHARD         000100D0               DS$_IPL2HI       = 006600B8     HP$M_ALLOC       = 00000001
DS$ERRPREP         00010108               DS$_IVADDR       = 00660040     HP$M_WASALL      = 00000002
DS$ERRSOFT         000100D8               DS$_IVVECT       = 00660038     HP$Q_DEVICE        00000000
DS$ERRSYS          000100C0               DS$_KRNLSTK      = 00660090     HP$T_DEVICE        0000000C
DS$ESCAPE          00010050               DS$_LOGIC        = 00660070     HP$T_TYPE          00000026
DS$FREEDBGSYM      000101B8               DS$_MCHK         = 00660088     HP$V_ALLOC       = 00000000
DS$GETBUF          00010120               DS$_MMOFF        = 00660058     HP$V_WASALL      = 00000001
DS$GETMEM          00010130               DS$_NEEDUNIT     = 006600F8     HP$W_SIZE          00000008
DS$GPHARD          00010018               DS$_NOPCS        = 00660110     HP$W_VECTOR        00000024
DS$HELP            000101B0               DS$_NORMAL       = 00660001     IPR              = 00000006   G
DS$INITSCB         00010170               DS$_NOSUPPORT    = 006600B1     KA$B_ACC_TYPE      00000042
DS$INLOOP          00010048               DS$_NOTDON       = 00660030     KA$B_SID_TYPE      0000003D
DS$K_ERROR       = 00000002               DS$_NOTIMP       = 006600B0     KA$K_LEN           00000043
DS$K_NORMAL      = 00000001               DS$_NULLSTR      = 00660010     KA$L_FLAGS         00000032
```

```
KA$L_SID            0000003A                SCB$L_POWER         0000000C                SYS$SETPRI          00010428
KA$M_CHAR         = 00000100                SCB$L_RADRMOD       0000001C                SYS$SETPRT          00010430
KA$M_CRC          = 00000010                SCB$L_ROPRAND       00000018                SYS$SETRWM          00010438
KA$M_D_FLOAT      = 00000002                SCB$L_RXDB          000000F8                SYS$SETSWM          00010448
KA$M_EDIT         = 00000080                SCB$L_SFTLVL1       00000084                SYS$ULKPAG          00010460
KA$M_F_FLOAT      = 00000001                SCB$L_SFTLVL10      000000A8                SYS$ULWSET          00010468
KA$M_G_FLOAT      = 00000004                SCB$L_SFTLVL11      000000AC                SYS$UNWIND          00010470
KA$M_H_FLOAT      = 00000008                SCB$L_SFTLVL12      000000B0                SYS$WAITFR          00010478
KA$M_PACKED       = 00000020                SCB$L_SFTLVL13      000000B4                SYS$WFLAND          00010488
KA$M_PACK_MUL     = 00000040                SCB$L_SFTLVL14      000000B8                SYS$WFLOR           00010490
KA$M_TODR         = 00010000                SCB$L_SFTLVL15      000000BC                T1_S1               0000003E RG     04
KA$V_CHAR         = 00000008                SCB$L_SFTLVL2       00000088                T1_S1_X             0000010D R      04
KA$V_CRC          = 00000004                SCB$L_SFTLVL3       0000008C                T1_S2               00000118 RG     04
KA$V_D_FLOAT      = 00000001                SCB$L_SFTLVL4       00000090                T1_S2_X             000001EE R      04
KA$V_EDIT         = 00000007                SCB$L_SFTLVL5       00000094                T1_S3               000001F9 RG     04
KA$V_F_FLOAT      = 00000000                SCB$L_SFTLVL6       00000098                T1_S3_X             000002C1 R      04
KA$V_G_FLOAT      = 00000002                SCB$L_SFTLVL7       0000009C                TEST_001            00000024 RG     04
KA$V_H_FLOAT      = 00000003                SCB$L_SFTLVL8       000000A0                TEST_001_X          000002CF RG     04
KA$V_PACKED       = 00000005                SCB$L_SFTLVL9       000000A4                TU58              = 00000002  G
KA$V_PACK_MUL     = 00000006                SCB$L_TBIT          00000028                T_FAULT_ERR_F       00000187 R      02
KA$V_TODR         = 00000010                SCB$L_TIMER         000000C0                T_FAULT_ERR_T       0000025A R      02
KA$W_LATENCY        0000003E                SCB$L_TRANSL        00000024                T_NO_FAULT_FROM     000001F2 R      02
KA$W_PROGRESS       00000040                SCB$L_TXDB          000000FC                T_NO_FAULT_TO       00000121 R      02
KA$W_RESERVED       00000038                SCB$L_ZERO          00000000                T_NO_KA730          000000E9 R      02
KA$W_WCS            00000036                SCOPE               000000AF R      04      T_REG_ADD           000002C5 R      02
KA_PTABLE           ********  X     04      SCOPE1              00000190 R      04      UBI               = 0000000A  G
KA_UNIT_NO          ********  X     04      SCOPE2              0000026A R      04      V_FAULT           = 00000001
LDPCTX            = 0000000B  G             SEP_FUNCTIONAL    = 00000002                V_NO_FAULT        = 00000000
L_REG_ADD           00000000 R      02      SEP_REPAIR        = 00000003                WCS               = 00000007  G
MANUAL            = 00000001  G             SIZ...            = 00000001
MCHK              = 00000005  G             SYS$ALLOC           00010238
MEM               = 00000009  G             SYS$ASCTIM          00010248
MSG_001             00000002 R      04      SYS$ASSIGN          00010250
M_FAULT           = 00000002                SYS$BINTIM          00010258
M_NO_FAULT        = 00000001                SYS$CANCEL          00010260
NEXT                00000061 R      04      SYS$CANTIM          00010268
NEXT1               0000013B R      04      SYS$CLOSE           000105B8
NEXT2               0000021C R      04      SYS$CLREF           00010298
POWER             = 00000003  G             SYS$CONNECT         000105C0
RENTRY_1            00000082 R      04      SYS$DALLOC          000102D8
RENTRY_2            000000C9 R      04      SYS$DASSGN          000102E0
RENTRY_3            0000015C R      04      SYS$DISCONNECT      000105D0
RENTRY_4            000001A3 R      04      SYS$FAO             00010350
RENTRY_5            0000023D R      04      SYS$FAOL            00010358
RENTRY_6            0000027D R      04      SYS$GET             00010580
SCB$L_ACCESS        00000020                SYS$GETCHN          000104C8
SCB$L_ARITH         00000034                SYS$GETTIM          00010378
SCB$L_BREAK         0000002C                SYS$LKWSET          000103A0
SCB$L_CHME          00000044                SYS$NUMTIM          000103B8
SCB$L_CHMK          00000040                SYS$OPEN            00010608
SCB$L_CHMS          00000048                SYS$QIO             000103C8
SCB$L_CHMU          0000004C                SYS$QIOW            00010200
SCB$L_COMPAT        00000030                SYS$READ            00010590
SCB$L_KNLSTK        00000008                SYS$READEF          000103D0
SCB$L_MACHCHK       00000004                SYS$SETAST          000103F8
SCB$L_OPCCUS        00000014                SYS$SETEF           00010400
SCB$L_OPCDEC        00000010                SYS$SETIMR          00010420
```

```
                                            +----------------+
                                            ! Psect synopsis !
                                            +----------------+
PSECT name                 Allocation          PSECT No.  Attributes
----------                 ----------          ---------  ----------
.  ABS  .                  00000000  (     0.)  00 (  0.)  NOPIC    USR    CON    ABS    LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
. BLANK .                  00000000  (     0.)  01 (  1.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD      WRT NOVEC BYTE
ENKAXA                     00000311  (   785.)  02 (  2.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
$ABS$                      00010610  (67088.)  03 (  3.)  NOPIC    USR    CON    ABS    LCL NOSHR   EXE   RD      WRT NOVEC BYTE
TEST_001                   000002D7  (   727.)  04 (  4.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
DISPATCH                   00000018  (    24.)  05 (  5.)  NOPIC    USR    CON    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
ARGLIST                    00000024  (    36.)  06 (  6.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC LONG
$TSTCNT                    00000004  (     4.)  07 (  7.)  NOPIC    USR    OVR    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
```

```
                                                                 E 12
ZZ-ENKAX-1.3     Cross reference                              3-AUG-1983           Fiche 1  Frame E12          Sequence 147
ENKAXA                          VAX-11/730 Specific CPU Cluster Exercise   3-AUG-1983 13:42:04  VAX-11 Macro V03-00         Page  18
Cross reference                                                           3-AUG-1983 09:52:27  WRKD$0:[PAN.ENKAX]ENKAXA.MAR;73   (9)

                                                +--------------------------+
                                                ! Symbol Cross Reference !
                                                +--------------------------+
SYMBOL          VALUE          DEFINITION       REFERENCES...
------          -----          ----------       -------------
$$$             =00000018-R    423     (9)      283     (7)     353     (8)     423     (9)
$$ARGS          =0000000A      84      (2)      84      (2)
$$E             =00000001      423     (9)      311     (7)     381     (8)     449     (9)
$$M             =00000005      442     (9)      237     (6)     294     (7)     303     (7)     365     (8)     374     (8)
                                                434     (9)     442     (9)
$$N             =00000001      442     (9)    #-206     (4)     207     (4)   #-241     (6)     294     (7)     303     (7)
                                                365     (8)     374     (8)     434     (9)     442     (9)     85      (2)
$$S             =FFFFFFFF      452     (9)      225     (6)     237     (6)     247     (7)     283     (7)     315     (8)
                                                353     (8)     385     (9)     423     (9)
$$T1            =0000002C      84      (2)      84      (2)
$ENV            =00000001      63      (2)
$ER             =FFFFFFFF      452     (9)      283     (7)   #-294     (7)   #-303     (7)     353     (8)   #-365     (8)
                                              #-374     (8)     423     (9)   #-434     (9)   #-442     (9)
$MO             =00000001      453     (9)      453     (9)
$S$             =00000018-R    423     (9)      283     (7)     311     (7)     353     (8)     381     (8)     423     (9)
                                                449     (9)
$ST             =00000000      452     (9)      237     (6)     247     (7)     283     (7)     294     (7)     295     (7)
                                                303     (7)     304     (7)     311     (7)     315     (8)     353     (8)
                                                365     (8)     366     (8)     374     (8)     375     (8)     381     (8)
                                                385     (9)     423     (9)     434     (9)     435     (9)     442     (9)
                                                443     (9)     449     (9)     452     (9)
$TN             =00000001      453     (9)      225     (6)     237     (6)     242     (6)     247     (7)     294     (7)
                                                303     (7)     315     (8)     365     (8)     374     (8)     385     (9)
                                                434     (9)     442     (9)     452     (9)     453     (9)
ADDRESS_TABLE    00000005-R    109     (3)      284     (7)
ADDRESS_TABLE1   000000B1-R    157     (3)      354     (8)
ADDRESS_TABLE2   000000C9-R    168     (3)      424     (9)
ALL             =00000008      85      (2)      237     (6)
BASE_001         00000000-R    225     (6)      237     (6)
BIT...          =00000011      83      (2)      63      (2)     80      (2)     82      (2)     83      (2)
B_FLAGS          00000004-R    92      (2)    #-220     (5)   #-287     (7)   #-291     (7)     293     (7)   #-297     (7)
                                              #-300     (7)     302     (7)   #-357     (8)   #-361     (8)     364     (8)
                                              #-368     (8)     373     (8)   #-427     (9)   #-431     (9)     433     (9)
                                              #-437     (9)     441     (9)
CEP_FUNCTIONAL  =00000000      63      (2)
CEP_REPAIR      =00000001      63      (2)      63      (2)
DATA_001         00000020-R    237     (6)      237     (6)
DEFAULT         =00000000      85      (2)      237     (6)
DS$ABORT         00010020      81      (2)
DS$ASKADR        00010090      81      (2)
DS$ASKDATA       00010080      81      (2)
DS$ASKLGCL       00010098      81      (2)
DS$ASKSTR        000100A0      81      (2)
DS$ASKVLD        00010088      81      (2)
DS$ATTACH        000101A8      81      (2)
DS$BGNSUB        00010030      81      (2)      283     (7)     353     (8)     423     (9)
DS$BRANCH        000100A8      81      (2)
DS$BREAK         00010058      81      (2)      363     (8)     372     (8)     452     (9)
DS$CANWAIT       00010070      81      (2)
DS$CHANNEL       00010180      81      (2)
```

```
DS$CKLOOP        00010040     81    (2)    295   (7)    304   (7)    366   (8)    375   (8)    435   (9)
                                           443   (9)
DS$CLRVEC        00010168     81    (2)    309   (7)    380   (8)    448   (9)
DS$CNTRLC        00010078     81    (2)
DS$CVTREG        000100B0     81    (2)
DS$ENDPASS       00010010     81    (2)
DS$ENDSUB        00010038     81    (2)    311   (7)    381   (8)    449   (9)
DS$ERRDEV        000100C8     81    (2)
DS$ERRHARD       000100D0     81    (2)    294   (7)    303   (7)    365   (8)    374   (8)    434   (9)
                                           442   (9)
DS$ERRPREP       00010108     81    (2)
DS$ERRSOFT       000100D8     81    (2)
DS$ERRSYS        000100C0     81    (2)
DS$ESCAPE        00010050     81    (2)
DS$FREEDBGSYM    000101B8     81    (2)
DS$GETBUF        00010120     81    (2)
DS$GETMEM        00010130     81    (2)
DS$GPHARD        00010018     81    (2)
DS$HELP          000101B0     81    (2)
DS$INITSCB       00010170     81    (2)
DS$INLOOP        00010048     81    (2)
DS$K_ERROR      =00000002     80    (2)
DS$K_NORMAL     =00000001     80    (2)
DS$K_SEVERE     =00000004     80    (2)
DS$K_SUBSYS     =00000066     80    (2)     80   (2)
DS$K_WARNING    =00000000     80    (2)
DS$LOAD          00010198     81    (2)
DS$LOADPCS       000101C0     81    (2)
DS$MAPDBGBLOCK   00010118     81    (2)
DS$MMOFF         00010158     81    (2)
DS$MMON          00010150     81    (2)
DS$MOVPHY        00010148     81    (2)
DS$MOVVRT        00010140     81    (2)
DS$PARSE         000100B8     81    (2)
DS$PRINTB        000100E0     81    (2)    206   (4)    207   (4)
DS$PRINTF        000100F0     81    (2)    241   (6)
DS$PRINTS        000100F8     81    (2)
DS$PRINTSIG      00010100     81    (2)
DS$PRINTX        000100E8     81    (2)
DS$PROBE         000101A0     81    (2)
DS$RELBUF        00010128     81    (2)
DS$RELMEM        00010138     81    (2)
DS$SETIPL        00010178     81    (2)
DS$SETMAP        00010188     81    (2)
DS$SETPRIEXV     00010110     81    (2)
DS$SETVEC        00010160     81    (2)    285   (7)    355   (8)    425   (9)
DS$SHOCHAN       00010190     81    (2)
DS$SUMMARY       00010028     81    (2)
DS$WAITMS        00010060     81    (2)
DS$WAITUS        00010068     81    (2)
DS$_ARITH       =006600D0     80    (2)
DS$_BADLINK     =006600F0     80    (2)
DS$_BADTYPE     =006600E8     80    (2)
DS$_CHME        =006600A8     80    (2)
DS$_CHMK        =006600E0     80    (2)
DS$_DEVNAME     =00660108     80    (2)
DS$_ERROR       =00660002     80    (2)
```

```
DS$_FHWE        =00660068      80       (2)
DS$_FRAGBUF     =00660080      80       (2)
DS$_ICBUSY      =006600C8      80       (2)
DS$_ICERR       =006600C0      80       (2)
DS$_IHWE        =00660060      80       (2)
DS$_ILLCHAR     =00660018      80       (2)
DS$_ILLPAGCNT   =00660078      80       (2)
DS$_ILLUNIT     =00660100      80       (2)
DS$_INSFMEM     =00660050      80       (2)
DS$_IPL2HI      =006600B8      80       (2)
DS$_IVADDR      =00660040      80       (2)
DS$_IVVECT      =00660038      80       (2)
DS$_KRNLSTK     =00660090      80       (2)
DS$_LOGIC       =00660070      80       (2)
DS$_MCHK        =00660088      80       (2)
DS$_MMOFF       =00660058      80       (2)
DS$_NEEDUNIT    =006600F8      80       (2)
DS$_NOPCS       =00660110      80       (2)
DS$_NORMAL      =00660001      80       (2)
DS$_NOSUPPORT   =006600B1      80       (2)
DS$_NOTDON      =00660030      80       (2)
DS$_NOTIMP      =006600B0      80       (2)       80      (2)
DS$_NULLSTR     =00660010      80       (2)
DS$_OVERFLOW    =00660008      80       (2)
DS$_POWER       =00660098      80       (2)
DS$_PROGERR     =00660020      80       (2)
DS$_SEVERE      =00660004      80       (2)
DS$_TRANSL      =006600A0      80       (2)
DS$_TRUNCATE    =00660028      80       (2)
DS$_UNEXPINT    =006600D8      80       (2)
DS$_VASFULL     =00660048      80       (2)
DS$_WARNING     =00660000      80       (2)       80      (2)
ENV$M_DOMAIN    =00000002      63       (2)
ENV$M_LEVEL     =00000001      63       (2)
ENV$M_SUPER     =000003FC      63       (2)
ENV$S_DOMAIN    =00000001      63       (2)
ENV$S_LEVEL     =00000001      63       (2)
ENV$S_SUPER     =00000008      63       (2)
ENV$V_DOMAIN    =00000001      63       (2)       63      (2)
ENV$V_LEVEL     =00000000      63       (2)       63      (2)
ENV$V_SUPER     =00000002      63       (2)
ENV$_CPU        =00000000      63       (2)       63      (2)
ENV$_FUNCTIONAL =00000000      63       (2)       63      (2)
ENV$_REPAIR     =00000001      63       (2)       63      (2)
ENV$_SUPER      =00000001      63       (2)
ENV$_SYSTEM     =00000001      63       (2)       63      (2)
ERR$_MSGADR     =0000000C      84       (2)
ERR$_NARGS      =0000000A      84       (2)
ERR$_NUM        =00000004      84       (2)
ERR$_P1         =00000014      84       (2)      206      (4)
ERR$_P2         =00000018      84       (2)
ERR$_P3         =0000001C      84       (2)
ERR$_P4         =00000020      84       (2)
ERR$_P5         =00000024      84       (2)
ERR$_P6         =00000028      84       (2)
ERR$_POINTER    =00000010      84       (2)
ERR$_UNIT       =00000008      84       (2)
```

```
ERR_MESSAGE       000002EB-R    204     (4)      294    (7)      303     (7)      365    (8)      374    (8)      434    (9)
                                                 442    (9)
FAULT_SERVICE     00000308-R    218     (5)      285    (7)      355     (8)      425    (9)
HALT             =00000004      85      (2)
HP$A_DEPENDENT    00000032      82      (2)      83     (2)
HP$A_DEVICE       00000018      82      (2)
HP$A_DVA          0000001C      82      (2)
HP$A_LINK         00000020      82      (2)
HP$B_DRIVE        0000000B      82      (2)
HP$B_FLAGS        0000000A      82      (2)
HP$M_ALLOC       =00000001      82      (2)
HP$M_WASALL      =00000002      82      (2)
HP$Q_DEVICE       00000000      82      (2)
HP$T_DEVICE       0000000C      82      (2)
HP$T_TYPE         00000026      82      (2)
HP$V_ALLOC       =00000000      82      (2)
HP$V_WASALL      =00000001      82      (2)
HP$W_SIZE         00000008      82      (2)
HP$W_VECTOR       00000024      82      (2)
IPR              =00000006      85      (2)      237    (6)
KA$B_ACC_TYPE     00000042      83      (2)
KA$B_SID_TYPE     0000003D      83      (2)
KA$K_LEN          00000043      83      (2)
KA$L_FLAGS        00000032      83      (2)
KA$L_SID          0000003A      83      (2)
KA$M_CHAR        =00000100      83      (2)
KA$M_CRC         =00000010      83      (2)
KA$M_D_FLOAT     =00000002      83      (2)
KA$M_EDIT        =00000080      83      (2)
KA$M_F_FLOAT     =00000001      83      (2)
KA$M_G_FLOAT     =00000004      83      (2)
KA$M_H_FLOAT     =00000008      83      (2)
KA$M_PACKED      =00000020      83      (2)
KA$M_PACK_MUL    =00000040      83      (2)
KA$M_TODR        =00010000      83      (2)
KA$V_CHAR        =00000008      83      (2)
KA$V_CRC         =00000004      83      (2)
KA$V_D_FLOAT     =00000001      83      (2)
KA$V_EDIT        =00000007      83      (2)
KA$V_F_FLOAT     =00000000      83      (2)
KA$V_G_FLOAT     =00000002      83      (2)
KA$V_H_FLOAT     =00000003      83      (2)
KA$V_PACKED      =00000005      83      (2)
KA$V_PACK_MUL    =00000006      83      (2)
KA$V_TODR        =00000010      83      (2)
KA$W_LATENCY      0000003E      83      (2)
KA$W_PROGRESS     00000040      83      (2)
KA$W_RESERVED     00000038      83      (2)
KA$W_WCS          00000036      83      (2)
KA_PTABLE         00000000-XR                   #-239   (6)
KA_UNIT_NO        00000000-XR                   #-294   (7)     #-303    (7)     #-365   (8)     #-374   (8)     #-434   (9)
                                                #-442   (9)
LDPCTX           =0000000B      85      (2)
L_REG_ADD         00000000-R    91      (2)     #-207   (4)     #-289    (7)     #-359   (8)     #-429   (9)
MANUAL           =00000001      85      (2)
MCHK             =00000005      85      (2)
MEM              =00000009      85      (2)
```

```
MSG_001          00000002-R   225     (6)       237      (6)
M_FAULT         =00000002     97      (2)     #-220      (5)
M_NO_FAULT      =00000001     95      (2)     #-291      (7)     #-300      (7)     #-361      (8)     #-431      (9)
NEXT             00000061-R   286     (7)       295      (7)     #-308      (7)
NEXT1            0000013B-R   356     (8)       366      (8)     #-379      (8)
NEXT2            0000021C-R   426     (9)       435      (9)     #-447      (9)
POWER           =00000003     85      (2)
RENTRY_1         00000082-R   292     (7)       286      (7)
RENTRY_2         000000C9-R   301     (7)       296      (7)
RENTRY_3         0000015C-R   362     (8)       356      (8)
RENTRY_4         000001A3-R   371     (8)       367      (8)
RENTRY_5         0000023D-R   432     (9)       426      (9)
RENTRY_6         0000027D-R   440     (9)       436      (9)
SCB$L_ACCESS     00000020     79      (2)
SCB$L_ARITH      00000034     79      (2)
SCB$L_BREAK      0000002C     79      (2)
SCB$L_CHME       00000044     79      (2)
SCB$L_CHMK       00000040     79      (2)
SCB$L_CHMS       00000048     79      (2)
SCB$L_CHMU       0000004C     79      (2)
SCB$L_COMPAT     00000030     79      (2)
SCB$L_KNLSTK     00000008     79      (2)
SCB$L_MACHCHK    00000004     79      (2)
SCB$L_OPCCUS     00000014     79      (2)
SCB$L_OPCDEC     00000010     79      (2)
SCB$L_POWER      0000000C     79      (2)
SCB$L_RADRMOD    0000001C     79      (2)
SCB$L_ROPRAND    00000018     79      (2)     #-285      (7)     #-309      (7)     #-355      (8)     #-380      (8)     #-425      (9)
                                              #-448      (9)
SCB$L_RXDB       000000F8     79      (2)
SCB$L_SFTLVL1    00000084     79      (2)
SCB$L_SFTLVL10   000000A8     79      (2)
SCB$L_SFTLVL11   000000AC     79      (2)
SCB$L_SFTLVL12   000000B0     79      (2)
SCB$L_SFTLVL13   000000B4     79      (2)
SCB$L_SFTLVL14   000000B8     79      (2)
SCB$L_SFTLVL15   000000BC     79      (2)
SCB$L_SFTLVL2    00000088     79      (2)
SCB$L_SFTLVL3    0000008C     79      (2)
SCB$L_SFTLVL4    00000090     79      (2)
SCB$L_SFTLVL5    00000094     79      (2)
SCB$L_SFTLVL6    00000098     79      (2)
SCB$L_SFTLVL7    0000009C     79      (2)
SCB$L_SFTLVL8    000000A0     79      (2)
SCB$L_SFTLVL9    000000A4     79      (2)
SCB$L_TBIT       00000028     79      (2)
SCB$L_TIMER      000000C0     79      (2)
SCB$L_TRANSL     00000024     79      (2)
SCB$L_TXDB       000000FC     79      (2)
SCB$L_ZERO       00000000     79      (2)
SCOPE            000000AF-R   296     (7)       304      (7)
SCOPE1           00000190-R   367     (8)       375      (8)
SCOPE2           0000026A-R   436     (9)       443      (9)
SEP_FUNCTIONAL  =00000002     63      (2)
SEP_REPAIR      =00000003     63      (2)
SIZ...          =00000001     83      (2)       63       (2)       82       (2)       83       (2)
SYS$ALLOC        00010238     81      (2)
```

```
SYS$ASCTIM       00010248       81     (2)
SYS$ASSIGN       00010250       81     (2)
SYS$BINTIM       00010258       81     (2)
SYS$CANCEL       00010260       81     (2)
SYS$CANTIM       00010268       81     (2)
SYS$CLOSE        000105B8       81     (2)
SYS$CLREF        00010298       81     (2)
SYS$CONNECT      000105C0       81     (2)
SYS$DALLOC       000102D8       81     (2)
SYS$DASSGN       000102E0       81     (2)
SYS$DISCONNECT   000105D0       81     (2)
SYS$FAO          00010350       81     (2)
SYS$FAOL         00010358       81     (2)
SYS$GET          00010580       81     (2)
SYS$GETCHN       000104C8       81     (2)
SYS$GETTIM       00010378       81     (2)
SYS$LKWSET       000103A0       81     (2)
SYS$NUMTIM       000103B8       81     (2)
SYS$OPEN         00010608       81     (2)
SYS$QIO          000103C8       81     (2)
SYS$QIOW         00010200       81     (2)
SYS$READ         00010590       81     (2)
SYS$READEF       000103D0       81     (2)
SYS$SETAST       000103F8       81     (2)
SYS$SETEF        00010400       81     (2)
SYS$SETIMR       00010420       81     (2)
SYS$SETPRI       00010428       81     (2)
SYS$SETPRT       00010430       81     (2)
SYS$SETRWM       00010438       81     (2)
SYS$SETSWM       00010448       81     (2)
SYS$ULKPAG       00010460       81     (2)
SYS$ULWSET       00010468       81     (2)
SYS$UNWIND       00010470       81     (2)
SYS$WAITFR       00010478       81     (2)
SYS$WFLAND       00010488       81     (2)
SYS$WFLOR        00010490       81     (2)
T1_S1            0000003E-R     283    (7)
T1_S1_X          0000010D-R     311    (7)
T1_S2            00000118-R     353    (8)
T1_S2_X          000001EE-R     381    (8)
T1_S3            000001F9-R     423    (9)
T1_S3_X          000002C1-R     449    (9)
TEST_001         00000024-R     237    (6)      237     (6)
TEST_001_X       000002CF-R     452    (9)    #-242     (6)
TU58            =00000002       85     (2)
T_FAULT_ERR_F    00000187-R     188    (4)    #-374     (8)
T_FAULT_ERR_T    0000025A-R     196    (4)    #-442     (9)
T_NO_FAULT_FROM  000001F2-R     192    (4)    #-303     (7)
T_NO_FAULT_TO    00000121-R     184    (4)    #-294     (7)     #-365     (8)     #-434     (9)
T_NO_KA730       000000E9-R     181    (4)      241     (6)
T_REG_ADD        000002C5-R     200    (4)      207     (4)
UBI             =0000000A       85     (2)
V_FAULT         =00000001       96     (2)    #-373     (8)     #-441     (9)
V_NO_FAULT      =00000000       94     (2)    #-293     (7)     #-302     (7)     #-364     (8)     #-433     (9)
WCS             =00000007       85     (2)
```

```
                                             +------------------------+
                                             ! Macros Cross Reference !
                                             +------------------------+
MACRO             SIZE          DEFINITION      REFERENCES...
-----             ----          ----------      -------------
$D1_BSUBT         1             283    (7)      283    (7)       353    (8)       423    (9)
$D1_BTEST         1             237    (6)      237    (6)
$D1_ERR           1             294    (7)      294    (7)       303    (7)       365    (8)       374    (8)       434    (9)
                                                442    (9)
$D1_ERR_S         1             294    (7)      294    (7)       303    (7)       365    (8)       374    (8)       434    (9)
                                                442    (9)
$D1_ESUBT         1             311    (7)      311    (7)       381    (8)       449    (9)
$D1_ETEST         1             452    (9)      452    (9)
$D1_EXTEST        1             242    (6)      242    (6)
$D1_PRINT_S       1             206    (4)      206    (4)       207    (4)       241    (6)
$D1_SBTTL         2             225    (6)      225    (6)       247    (7)       315    (8)       385    (9)
$D2_BDATA         1             237    (6)      237    (6)
$D2_BTEST         1             237    (6)      237    (6)
$D2_SBTTL         1             225    (6)      225    (6)
$DEF              1             83     (2)      79     (2)       81     (2)       82     (2)       83     (2)
$DEFEND           1             79     (2)      79     (2)       81     (2)       82     (2)       83     (2)
$DEFINI           1             79     (2)      79     (2)       81     (2)       82     (2)       83     (2)
$DS_BGNMESSAGE    1             205    (4)      205    (4)
$DS_BGNMOD        1             63     (2)      63     (2)
$DS_BGNSUB        1             283    (7)      283    (7)       353    (8)       423    (9)
$DS_BGNTEST       1             237    (6)      237    (6)
$DS_BREAK         1             363    (8)      363    (8)       372    (8)       452    (9)
$DS_CKLOOP        1             295    (7)      295    (7)       304    (7)       366    (8)       375    (8)       435    (9)
                                                443    (9)
$DS_CLRVEC_S      1             309    (7)      309    (7)       380    (8)       448    (9)
$DS_DSDEF         2             80     (2)      80     (2)
$DS_DSSDEF        1             81     (2)      81     (2)
$DS_ENDDATA       1             237    (6)      237    (6)
$DS_ENDMESSAGE    1             208    (4)      208    (4)
$DS_ENDMOD        1             453    (9)      453    (9)
$DS_ENDSUB        1             311    (7)      311    (7)       381    (8)       449    (9)
$DS_ENDTEST       1             452    (9)      452    (9)
$DS_ENVDEF        2             63     (2)      63     (2)
$DS_ERRDEF        1             84     (2)      84     (2)
$DS_ERRHARD_S     1             294    (7)      294    (7)       303    (7)       365    (8)       374    (8)       434    (9)
                                                442    (9)
$DS_EXIT          1             242    (6)      242    (6)
$DS_HPODEF        2             82     (2)      82     (2)
$DS_PAGE          1             223    (5)      223    (5)       245    (6)       313    (7)       383    (8)       451    (9)
$DS_PRINTB_S      1             206    (4)      206    (4)       207    (4)
$DS_PRINTF_S      1             241    (6)      241    (6)
$DS_SBTTL         1             225    (6)      225    (6)       247    (7)       315    (8)       385    (9)
$DS_SCBDEF        1             79     (2)      79     (2)
$DS_SECDEF        1             85     (2)      85     (2)
$DS_SETVEC_S      1             285    (7)      285    (7)       355    (8)       425    (9)
$EQU              1             83     (2)      63     (2)       80     (2)
$EQULS1           1             80     (2)      63     (2)       80     (2)
$EQULST           1             63     (2)      63     (2)       80     (2)
$GBLINI           2             63     (2)      63     (2)       79     (2)       80     (2)       81     (2)       82     (2)
                                                83     (2)
```

```
$HP_DEFDEF          1            82     (2)
$KADEF              1            83     (2)
$OFFDEF             1            84     (2)          84     (2)
$PUSHADR            1            294    (7)          294    (7)          303    (7)          365    (8)          374    (8)          434    (9)
                                                     442    (9)
$VIELD              1            63     (2)          63     (2)          82     (2)          83     (2)
$VIELD1             1            83     (2)          63     (2)          82     (2)          83     (2)
ENKAX_SECDEF        1            85     (2)          85     (2)
KA_DEF              2            83     (2)          83     (2)

                                             +-------------------------+
                                             ! Performance indicators !
                                             +-------------------------+

Phase                     Page faults    CPU Time        Elapsed Time
-----                     -----------    --------        ------------
Initialization                     21    00:00:00.06     00:00:00.15
Command processing                 29    00:00:00.20     00:00:00.65
Pass 1                            752    00:00:11.08     00:00:32.18
Symbol table sort                   0    00:00:00.43     00:00:01.10
Pass 2                            169    00:00:02.19     00:00:04.89
Symbol table output                29    00:00:00.19     00:00:00.64
Psect synopsis output               6    00:00:00.04     00:00:00.13
Cross-reference output             96    00:00:01.43     00:00:04.98
Assembler run totals             1106    00:00:15.64     00:00:44.77

The working set limit was 900 pages.
85368 bytes (167 pages) of virtual memory were used to buffer the intermediate code.
There were 20 pages of symbol table space allocated to hold 314 non-local and 13 local symbols.
454 source lines were read in Pass 1, producing 25 object records in Pass 2.
93 pages of virtual memory were used to define 48 macros.

                                            +---------------------------+
                                            ! Macro library statistics !
                                            +---------------------------+

Macro library name                           Macros defined
------------------                           --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                         2
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                      38
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                      7
TOTALS (all libraries)                                47

692 GETS were required to define 47 macros.

There were no errors, warnings or information messages.

/LIS/CRO ENKAXA
```

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```
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    (2)         53          DECLARATIONS
    (3)         92          TEST 2:  UNPREDICTABLE Results
    (4)        107          SUBTEST 2.1:  Writes to the Instruction
    (5)        123          SUBTEST 2.2:  Register Mode Addressing I
    (6)        142          SUBTEST 2.3:  Addressing Mode (PC) and -
    (7)        161          SUBTEST 2.4:  Addressing Modes 6, 7, or
    (8)        178          SUBTEST 2.5:  Floating Point Data Used a
    (9)        195          SUBTEST 2.6:  FPD Set by the Program
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```

```
0000            .SBTTL  ENKAXB: ARCHITECTURE 'UNPREDICTABLE'' AND 'UNDEFINED'' OPERATIONS
0000            .TITLE  ENKAXB  VAX-11/730 Specific CPU Cluster Exerciser
0000            .IDENT  /1.2/
0000
0000    ;
0000    ; Copyright (C) 1980
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0000    ; software on equipment which is not supplied by DEC.
0000    ;
0000
0000    ;++
0000    ; Facility:       VAX Architecture Diagnostic.
0000    ;
0000    ; Abstract:       This module was not implemented for any VAX processor and it was
0000    ;                 agreed at the Nebula functional specification review that it
0000    ;                 will not be implemented for the VAX 11/730. The amount of effort
0000    ;                 required is excessive and the payback in terms of design
0000    ;                 verification coverage is felt to be minimal.
0000    ;
0000    ;
0000    ; Environment:    VAX Diagnostic Supervisor.
0000    ;
0000    ; Author:         Rich Lewis       13-Dec-80        Version 1X
0000    ;
0000    ;                 Tai-Chun Pan     01-Apr-83        Version 1.2
0000    ;
0000    ;                 Added quick flag on Test 7(TU58). If quick flag is set
0000    ;                 will skip subtest 4 through subtest 11.  Added event flag 3.
0000    ;                 If event flag 3 is set, will override protection,
0000    ;                 i.e., go ahead and write on tape.  If run APT & event flag 3
0000    ;                 is clear & tape is not scratch, will report an error.
0000    ;
0000    ;                 Modified Unibus sizer on Test 8 & 9. make test run faster.
0000    ;
0000    ;
0000    ;
0000    ;--
```

```
                    0000     53             .SBTTL  DECLARATIONS
                    0000     54             .LIST   MEB
                    0000     55             .NLIST  CND
                00000000     56             .PSECT  ENKAXB, PAGE, NOWRT
                    0000     57             .LIBRARY        "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                    0000     58             $DS_BGNMOD      CEP_REPAIR, TN=2
                    0000        ;;;         Macro-32 Diagnostic macro library Version 6.10 "DIAG.MLB (137)"
                    0000     59
                    0000     60  ;
                    0000     61  ; Include files:
                    0000     62  ;
                    0000     63
                    0000     64             .LIBRARY        "ENKAX"         ; CPU Cluster Exerciser library.
                    0000     65
                    0000     66  ;
                    0000     67  ; Macros:
                    0000     68  ;
                    0000     69
                    0000     70
                    0000     71  ;
                    0000     72  ; Equated symbols:
                    0000     73  ;
                    0000     77
                    0000     78             $DS_SCBDEF
                    0000     79             $DS_DSDEF
                    0000     80             $DS_DSSDEF
                    0000     81             ENKAX_SECDEF
                    0000     82
                    0000     83  ;
                    0000     84  ; Own storage:
                    0000     85  ;
                    0000     89
                    0000     90             $DS_PAGE
```

```
ZZ-
ENK
Pse


PSE
---

. 
. E
ENK
$AE
TES
DIS
ARC
$TS
```

```
                        0000              .SBTTL  TEST 2:  UNPREDICTABLE Results
                    00000000                      .PSECT  TEST_002, PAGE, NOWRT
                        001C
                        001C     93  ; ++
                        001C     94  ; Test description:
                        001C     95  ;
                        001C     96  ;        This test checks most operations which are specified as producing
                        001C     97  ;        UNPREDICTABLE results.  The state of the processor is verified
                        001C     98  ;        after the operation to insure that no undefined side affects occurred.
                        001C     99  ;
                        001C    100  ;
                        001C    101  ;--
                        001C    102
                        001C    103          $DS_BGNTEST
                        001C         DATA_002:
            00000000    001C                          .LONG   0               ; TEST ARGUMENT TABLE TERMINATOR
                        0020         TEST_002::
                0000    0020                          .WORD   ^M<>            ; ENTRY MASK
                        0022    104
                        0022    105          $DS_PAGE
```

```
ZZ-
ENK
Cro

SYM
---
$$$

$$E

$$M
$$N
$$S

$EN
$ER

$MC
$S$

$ST

$TM

ALL
BAS
BIT
CER
CER
DAT
DEF
DS$
DS$
DS$
DS$
DS$
DS$
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DS$
DS$
```

```
                              0022            .SBTTL  SUBTEST 2.1:  Writes to the Instruction Stream
                              0022    108 ; +
                              0022    109 ; Subtest description:
                              0022    110 ;
                              0022    111 ;       This subtest attempts carefully planned writes to the I-stream and
                              0022    112 ;       checks that the memory in the area of the instruction contains the
                              0022    113 ;       correct data.
                              0022    114 ;
                              0022    115 ;-
                              0022    116
                              0022    117         $DS_BGNSUB
                              0022        T2_S1::
 00010030 9F    00000000'EF   FA  0022                    CALLG   $S$, @#DS$BGNSUB
                              002D    118
                              002D    119         $DS_ENDSUB
                              002D        T2_S1_X:
 00010038 9F    00000000'EF   FA  002D                    CALLG   $S$, @#DS$ENDSUB
                              0038    120
                              0038    121         $DS_PAGE
```

```
                               0038          .SBTTL  SUBTEST 2.2:  Register Mode Addressing Involving the PC
                               0038     ; +
                               0038     ; Subtest description:
                               0038     ;
                               0038     ;       This subtest does register mode addressing which involves the PC
                               0038     ;       using all the possible data types and checks that registers beyond
                               0038     ;       the range of the data type are not effected.
                               0038     ;
                               0038     ;       Note:  If the PC is modified in an undeterministic manner, an error
                               0038     ;       will probably result, but the report may not relate it to this test.
                               0038     ;
                               0038     ;-
                               0038
                               0038             $DS_BGNSUB
                               0038     T2_S2::
00010030 9F   0000000C'EF   FA 0038                     CALLG   $S$, @#DS$BGNSUB
                               0043
                               0043             $DS_ENDSUB
                               0043     T2_S2_X:
00010038 9F   0000000C'EF   FA 0043                     CALLG   $S$, @#DS$ENDSUB
                               004E
                               004E             $DS_PAGE
```

```
                                  004E              .SBTTL  SUBTEST 2.3:  Addressing Mode (PC) and -(PC)
                                  004E    143 ; +
                                  004E    144 ; Subtest description:
                                  004E    145 ;
                                  004E    146 ;       This subtest does register deferred and auto-decrement mode addressing
                                  004E    147 ;       using the PC with all the possible data types and checks that the
                                  004E    148 ;       memory containing the instructions are not undeterministicly modified.
                                  004E    149 ;
                                  004E    150 ;       Note:  If the PC is modified in an undeterministic manner, an error
                                  004E    151 ;       will probably result, but the report may not relate it to this test.
                                  004E    152 ;
                                  004E    153 ;-
                                  004E    154
                                  004E    155       $DS_BGNSUB
                                  004E        T2_S3::
  00010030 9F   00000018'EF   FA  004E                      CALLG   $S$, @#DS$BGNSUB
                                  0059    156
                                  0059    157       $DS_ENDSUB
                                  0059        T2_S3_X:
  00010038 9F   00000018'EF   FA  0059                      CALLG   $S$, @#DS$ENDSUB
                                  0064    158
                                  0064    159       $DS_PAGE
                                  0064              .SBTTL  SUBTEST 2.4:  Addressing Modes 6, 7, or 8 Indexed, Same Register
                                  0064    162 ; +
                                  0064    163 ; Subtest description:
                                  0064    164 ;
                                  0064    165 ;         This subtest checks that auto-increment indexed, auto-increment
                                  0064    166 ;         deferred indexed and auto-decrement indexed modes using the same
                                  0064    167 ;         register as the both the bae and the index will not produce
                                  0064    168 ;         undeterministic results.
                                  0064    169 ;
                                  0064    170 ;-
                                  0064    171
                                  0064    172           $DS_BGNSUB
                                  0064        T2_S4::
    00010030 9F   00000024'EF   FA 0064                         CALLG   $S$, @#DS$BGNSUB
                                  006F    173
                                  006F    174           $DS_ENDSUB
                                  006F        T2_S4_X:
    00010038 9F   00000024'EF   FA 006F                         CALLG   $S$, @#DS$ENDSUB
                                  007A    175
                                  007A    176           $DS_PAGE
```

```
ZZ
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T2
T2
T2
T2
TE
TE
TU
UB
WC
```

```
                                        007A              .SBTTL  SUBTEST 2.5:  Floating Point Data Used as an Address
                                        007A    179 ; +
                                        007A    180 ; Subtest description:
                                        007A    181 ;
                                        007A    182 ;     .     This subtest checks that auto-increment, auto-increment deferred and
                                        007A    183 ;           auto-decrement modes using a register that contains a floating point
                                        007A    184 ;           value for the same instruction will not produce undeterministic
                                        007A    185 ;           results.
                                        007A    186 ;
                                        007A    187 ;-
                                        007A    188
                                        007A    189             $DS_BGNSUB
                                        007A        T2_S5::
     00010030 9F    00000030'EF    FA   007A                    CALLG   $S$, @#DS$BGNSUB
                                        0085    190
                                        0085    191             $DS_ENDSUB
                                        0085        T2_S5_X:
     00010038 9F    00000030'EF    FA   0085                    CALLG   $S$, @#DS$ENDSUB
                                        0090    192
                                        0090    193             $DS_PAGE
```

```
                                       0090              .SBTTL  SUBTEST 2.6:  FPD Set by the Program
                                       0090     196 ; +
                                       0090     197 ; Subtest description:
                                       0090     198 ;
                                       0090     199 ;       This subtest sets the First Part Done bit in the PSL (Via an REI),
                                       0090     200 ;       then tries to execute an instruction that doesn't allow FPD.  The
                                       0090     201 ;       result should be a reserved instruction fault on the VAX-11/730.
                                       0090     202 ;
                                       0090     203 ;-
                                       0090     204
                                       0090     205             $DS_BGNSUB
                                       0090         T2_S6::
     00010030 9F    0000003C'EF    FA  0090                         CALLG   $S$, @#DS$BGNSUB
                                       009B     206
                                       009B     207             $DS_ENDSUB
                                       009B         T2_S6_X:
     00010038 9F    0000003C'EF    FA  009B                         CALLG   $S$, @#DS$ENDSUB
                                       00A6     208
                                       00A6     209             $DS_PAGE
```

```
                              00A6               .SBTTL  SUBTEST 2.7:  Clearing TP and not T
                              00A6       ; +
                              00A6       ; Subtest description:
                              00A6       ;
                              00A6       ;       This subtest generates an exception while the T-bit is set which sets
                              00A6       ;       the TP-bit.  Then the TP-bit is cleared, the exception condition is
                              00A6       ;       cleared, and execution is resumed.  A trace trap is expected after the
                              00A6       ;       next instruction, at the latest, and the processor state is checked
                              00A6       ;       for possible side effects.
                              00A6       ;
                              00A6       ;-
                              00A6
                              00A6               $DS_BGNSUB
                              00A6       T2_S7::
00010030 9F   00000048'EF   FA 00A6                       CALLG   $S$, @#DS$BGNSUB
                              00B1
                              00B1               $DS_ENDSUB
                              00B1       T2_S7_X:
00010038 9F   00000048'EF   FA 00B1                       CALLG   $S$, @#DS$ENDSUB
                              00BC
                              00BC               $DS_PAGE
```

```
                                00BC                .SBTTL  SUBTEST 2.8:  Referrences to the Current SP Via MTPR or MFPR
                                00BC   230 ; +
                                00BC   231 ; Subtest description:
                                00BC   232 ;
                                00BC   233 ;          This subtest tries to read and write the current modes stack pointer
                                00BC   234 ;          using the MFPR and MTPR instructions.  This is done for both the
                                00BC   235 ;          kernel and interrupt stack pointers.
                                00BC   236 ;
                                00BC   237 ;-
                                00BC   238
                                00BC   239                $DS_BGNSUB
                                00BC          T2_S8::
   00010030 9F   00000054'EF   FA  00BC                       CALLG   $S$, @#DS$BGNSUB
                                00C7   240
                                00C7   241                $DS_ENDSUB
                                00C7          T2_S8_X:
   00010038 9F   00000054'EF   FA  00C7                       CALLG   $S$, @#DS$ENDSUB
                                00D2   242
                                00D2   243                $DS_PAGE
```

```
             50    01    D0  00D2                      MOVL    #1, R0          ; NORMAL EXIT
                             00D5       TEST_002_X::
    00010058 9F    6E    FA  00D5                      CALLG   (SP), @#DS$BREAK
                         04  00DC                      RET                     ; RETURN TO TEST SEQUENCER
                             00DD   246
                         00000000                      .PSECT  $TSTCNT, NOEXE, NOWRT, OVR, LONG
                 00000002  0000                        .LONG   $TN
                             0004   248
                             0004   249         .END
```

```
$$$            = 00000054 R    06    DS$MMOFF        00010158       DS$_UNEXPINT   = 006600D8
$$E            = 00000001            DS$MMON         00010150       DS$_VASFULL    = 00660048
$$M            = 00000001            DS$MOVPHY       00010148       DS$_WARNING    = 00660000
$$N            = 00000000            DS$MOVVRT       00010140       ENV$M_DOMAIN   = 00000002
$$S            = FFFFFFFF            DS$PARSE        000100B8       ENV$M_LEVEL    = 00000001
$ENV           = 00000001  G         DS$PRINTB       000100E0       ENV$M_SUPER    = 000003FC
$ER            = FFFFFFFF            DS$PRINTF       000100F0       ENV$S_DOMAIN   = 00000001
$MO            = 00000001  G         DS$PRINTS       000100F8       ENV$S_LEVEL    = 00000001
$S$            = 00000054 R    06    DS$PRINTSIG     00010100       ENV$S_SUPER    = 00000008
$ST            = 00000000            DS$PRINTX       000100E8       ENV$V_DOMAIN   = 00000001
$TN            = 00000002            DS$PROBE        000101A0       ENV$V_LEVEL    = 00000000
ALL            = 00000008  G         DS$RELBUF       00010128       ENV$V_SUPER    = 00000002
BASE_002         00000000 R    04    DS$RELMEM       00010138       ENV$_CPU       = 00000000
BIT...         = 00660118            DS$SETIPL       00010178       ENV$_FUNCTIONAL= 00000000
CEP_FUNCTIONAL = 00000000            DS$SETMAP       00010188       ENV$_REPAIR    = 00000001
CEP_REPAIR     = 00000001            DS$SETPRIEXV    00010110       ENV$_SUPER     = 00000001
DATA_002         0000001C R    04    DS$SETVEC       00010160       ENV$_SYSTEM    = 00000001
DEFAULT        = 00000000  G         DS$SHOCHAN      00010190       HALT           = 00000004  G
DS$ABORT         00010020            DS$SUMMARY      00010028       IPR            = 00000006  G
DS$ASKADR        00010090            DS$WAITMS       00010060       LDPCTX         = 0000000B  G
DS$ASKDATA       00010080            DS$WAITUS       00010068       MANUAL         = 00000001  G
DS$ASKLGCL       00010098            DS$_ARITH     = 006600D0       MCHK           = 00000005  G
DS$ASKSTR        000100A0            DS$_BADLINK   = 006600F0       MEM            = 00000009  G
DS$ASKVLD        00010088            DS$_BADTYPE   = 006600E8       MSG_002          00000002 R    04
DS$ATTACH        000101A8            DS$_CHME      = 006600A8       POWER          = 00000003  G
DS$BGNSUB        00010030            DS$_CHMK      = 006600E0       SCB$L_ACCESS     00000020
DS$BRANCH        000100A8            DS$_DEVNAME   = 00660108       SCB$L_ARITH      00000034
DS$BREAK         00010058            DS$_ERROR     = 00660002       SCB$L_BREAK      0000002C
DS$CANWAIT       00010070            DS$_FHWE      = 00660068       SCB$L_CHME       00000044
DS$CHANNEL       00010180            DS$_FRAGBUF   = 00660080       SCB$L_CHMK       00000040
DS$CKLOOP        00010040            DS$_ICBUSY    = 006600C8       SCB$L_CHMS       00000048
DS$CLRVEC        00010168            DS$_ICERR     = 006600C0       SCB$L_CHMU       0000004C
DS$CNTRLC        00010078            DS$_IHWE      = 00660060       SCB$L_COMPAT     00000030
DS$CVTREG        000100B0            DS$_ILLCHAR   = 00660018       SCB$L_KNLSTK     00000008
DS$ENDPASS       00010010            DS$_ILLPAGCNT = 00660078       SCB$L_MACHCHK    00000004
DS$ENDSUB        00010038            DS$_ILLUNIT   = 00660100       SCB$L_OPCCUS     00000014
DS$ERRDEV        000100C8            DS$_INSFMEM   = 00660050       SCB$L_OPCDEC     00000010
DS$ERRHARD       000100D0            DS$_IPL2HI    = 006600B8       SCB$L_POWER      0000000C
DS$ERRPREP       00010108            DS$_IVADDR    = 00660040       SCB$L_RADRMOD    0000001C
DS$ERRSOFT       000100D8            DS$_IVVECT    = 00660038       SCB$L_ROPRAND    00000018
DS$ERRSYS        000100C0            DS$_KRNLSTK   = 00660090       SCB$L_RXDB       000000F8
DS$ESCAPE        00010050            DS$_LOGIC     = 00660070       SCB$L_SFTLVL1    00000084
DS$FREEDBGSYM    000101B8            DS$_MCHK      = 00660088       SCB$L_SFTLVL10   000000A8
DS$GETBUF        00010120            DS$_MMOFF     = 00660058       SCB$L_SFTLVL11   000000AC
DS$GETMEM        00010130            DS$_NEEDUNIT  = 006600F8       SCB$L_SFTLVL12   000000B0
DS$GPHARD        00010018            DS$_NOPCS     = 00660110       SCB$L_SFTLVL13   000000B4
DS$HELP          000101B0            DS$_NORMAL    = 00660001       SCB$L_SFTLVL14   000000B8
DS$INITSCB       00010170            DS$_NOSUPPORT = 006600B1       SCB$L_SFTLVL15   000000BC
DS$INLOOP        00010048            DS$_NOTDON    = 00660030       SCB$L_SFTLVL2    00000088
DS$K_ERROR     = 00000002            DS$_NOTIMP    = 006600B0       SCB$L_SFTLVL3    0000008C
DS$K_NORMAL    = 00000001            DS$_NULLSTR   = 00660010       SCB$L_SFTLVL4    00000090
DS$K_SEVERE    = 00000004            DS$_OVERFLOW  = 00660008       SCB$L_SFTLVL5    00000094
DS$K_SUBSYS    = 00000066            DS$_POWER     = 00660098       SCB$L_SFTLVL6    00000098
DS$K_WARNING   = 00000000            DS$_PROGERR   = 00660020       SCB$L_SFTLVL7    0000009C
DS$LOAD          00010198            DS$_SEVERE    = 00660004       SCB$L_SFTLVL8    000000A0
DS$LOADPCS       000101C0            DS$_TRANSL    = 006600A0       SCB$L_SFTLVL9    000000A4
DS$MAPDBGBLOCK   00010118            DS$_TRUNCATE  = 00660028       SCB$L_TBIT       00000028
```

```
SCB$L_TIMER        000000C0                    T2_S7_X            000000B1 R      04
SCB$L_TRANSL       00000024                    T2_S8              000000BC RG     04
SCB$L_TXDB         000000FC                    T2_S8_X            000000C7 R      04
SCB$L_ZERO         00000000                    TEST_002           00000020 RG     04
SEP_FUNCTIONAL = 00000002                      TEST_002_X         000000D5 RG     04
SEP_REPAIR     = 00000003                      TU58             = 00000002  G
SIZ...         = 00000008                      UBI              = 0000000A  G
SYS$ALLOC          00010238                    WCS              = 00000007  G
SYS$ASCTIM         00010248
SYS$ASSIGN         00010250
SYS$BINTIM         00010258
SYS$CANCEL         00010260
SYS$CANTIM         00010268
SYS$CLOSE          000105B8
SYS$CLREF          00010298
SYS$CONNECT        000105C0
SYS$DALLOC         000102D8
SYS$DASSGN         000102E0
SYS$DISCONNECT     000105D0
SYS$FAO            00010350
SYS$FAOL           00010358
SYS$GET            00010580
SYS$GETCHN         000104C8
SYS$GETTIM         00010378
SYS$LKWSET         000103A0
SYS$NUMTIM         000103B8
SYS$OPEN           00010608
SYS$QIO            000103C8
SYS$QIOW           00010200
SYS$READ           00010590
SYS$READEF         000103D0
SYS$SETAST         000103F8
SYS$SETEF          00010400
SYS$SETIMR         00010420
SYS$SETPRI         00010428
SYS$SETPRT         00010430
SYS$SETRWM         00010438
SYS$SETSWM         00010448
SYS$ULKPAG         00010460
SYS$ULWSET         00010468
SYS$UNWIND         00010470
SYS$WAITFR         00010478
SYS$WFLAND         00010488
SYS$WFLOR          00010490
T2_S1              00000022 RG     04
T2_S1_X            0000002D R      04
T2_S2              00000038 RG     04
T2_S2_X            00000043 R      04
T2_S3              0000004E RG     04
T2_S3_X            00000059 R      04
T2_S4              00000064 RG     04
T2_S4_X            0000006F R      04
T2_S5              0000007A RG     04
T2_S5_X            00000085 R      04
T2_S6              00000090 RG     04
T2_S6_X            0000009B R      04
T2_S7              000000A6 RG     04
```

```
                                            +----------------+
                                            ! Psect synopsis !
                                            +----------------+
PSECT name                  Allocation          PSECT No.  Attributes
----------                  ----------          ---------  ----------
.  ABS  .                   00000000  (     0.)  00 (  0.)  NOPIC   USR   CON   ABS   LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
. BLANK .                   00000000  (     0.)  01 (  1.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD     WRT NOVEC BYTE
ENKAXB                      00000000  (     0.)  02 (  2.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
$ABS$                       00010610  (67088.)  03 (  3.)  NOPIC   USR   CON   ABS   LCL NOSHR   EXE   RD     WRT NOVEC BYTE
TEST_002                    000000DD  (   221.)  04 (  4.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
DISPATCH                    00000018  (    24.)  05 (  5.)  NOPIC   USR   CON   REL   LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
ARGLIST                     00000060  (    96.)  06 (  6.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC LONG
$TSTCNT                     00000004  (     4.)  07 (  7.)  NOPIC   USR   OVR   REL   LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
```

```
                                                   +---------------------------+
                                                   ! Symbol Cross Reference !
                                                   +---------------------------+
SYMBOL            VALUE            DEFINITION      REFERENCES...
------            -----            ----------      -------------
$$$               =00000054-R      239    (11)     117     (4)     136     (5)     155     (6)     172     (7)     189     (8)
                                                   205     (9)     223     (10)    239     (11)
$$E               =00000001        239    (11)     119     (4)     138     (5)     157     (6)     174     (7)     191     (8)
                                                   207     (9)     225     (10)    241     (11)
$$M               =00000001        103    (3)      103     (3)
$$N               =00000000        103    (3)      81      (2)
$$S               =FFFFFFFF        245    (12)     103     (3)     107     (4)     117     (4)     123     (5)     136     (5)
                                                   142     (6)     155     (6)     161     (7)     172     (7)     178     (8)
                                                   189     (8)     195     (9)     205     (9)     211     (10)    223     (10)
                                                   229     (11)    239     (11)    92      (3)
$ENV              =00000001        58     (2)
$ER               =FFFFFFFF        245    (12)     117     (4)     136     (5)     155     (6)     172     (7)     189     (8)
                                                   205     (9)     223     (10)    239     (11)
$MO               =00000001        247    (12)     247     (12)
$S$               =00000054-R      239    (11)     117     (4)     119     (4)     136     (5)     138     (5)     155     (6)
                                                   157     (6)     172     (7)     174     (7)     189     (8)     191     (8)
                                                   205     (9)     207     (9)     223     (10)    225     (10)    239     (11)
                                                   241     (11)
$ST               =00000000        245    (12)     103     (3)     107     (4)     117     (4)     119     (4)     123     (5)
                                                   136     (5)     138     (5)     142     (6)     155     (6)     157     (6)
                                                   161     (7)     172     (7)     174     (7)     178     (8)     189     (8)
                                                   191     (8)     195     (9)     205     (9)     207     (9)     211     (10)
                                                   223     (10)    225     (10)    229     (11)    239     (11)    241     (11)
                                                   245     (12)
$TN               =00000002        247    (12)     103     (3)     107     (4)     123     (5)     142     (6)     161     (7)
                                                   178     (8)     195     (9)     211     (1C)    229     (11)    245     (12)
                                                   247     (12)    92      (3)
ALL               =00000008        81     (2)
BASE_002           00000000-R      92     (3)      103     (3)
BIT...            =00660118        79     (2)      58      (2)     79      (2)
CEP_FUNCTIONAL    =00000000        58     (2)
CEP_REPAIR        =00000001        58     (2)      58      (2)
DATA_002           0000001C-R      103    (3)      103     (3)
DEFAULT           =00000000        81     (2)
DS$ABORT           00010020        80     (2)
DS$ASKADR          00010090        80     (2)
DS$ASKDATA         00010080        80     (2)
DS$ASKLGCL         00010098        80     (2)
DS$ASKSTR          000100A0        80     (2)
DS$ASKVLD          00010088        80     (2)
DS$ATTACH          000101A8        80     (2)
DS$BGNSUB          00010030        80     (2)      117     (4)     136     (5)     155     (6)     172     (7)     189     (8)
                                                   205     (9)     223     (10)    239     (11)
DS$BRANCH          000100A8        80     (2)
DS$BREAK           00010058        80     (2)      245     (12)
DS$CANWAIT         00010070        80     (2)
DS$CHANNEL         00010180        80     (2)
DS$CKLOOP          00010040        80     (2)
DS$CLRVEC          00010168        80     (2)
DS$CNTRLC          C0010078        80     (2)
```

```
DS$CVTREG         000100B0      80        (2)
DS$ENDPASS        00010010      80        (2)
DS$ENDSUB         00010038      80        (2)       119      (4)       138      (5)       157      (6)       174      (7)       191      (8)
                                                    207      (9)       225      (10)      241      (11)
DS$ERRDEV         000100C8      80        (2)
DS$ERRHARD        000100D0      80        (2)
DS$ERRPREP        00010108      80        (2)
DS$ERRSOFT        000100D8      80        (2)
DS$ERRSYS         000100C0      80        (2)
DS$ESCAPE         00010050      80        (2)
DS$FREEDBGSYM     000101B8      80        (2)
DS$GETBUF         00010120      80        (2)
DS$GETMEM         00010130      80        (2)
DS$GPHARD         00010018      80        (2)
DS$HELP           000101B0      80        (2)
DS$INITSCB        00010170      80        (2)
DS$INLOOP         00010048      80        (2)
DS$K_ERROR       =00000002      79        (2)
DS$K_NORMAL      =00000001      79        (2)
DS$K_SEVERE      =00000004      79        (2)
DS$K_SUBSYS      =00000066      79        (2)       79       (2)
DS$K_WARNING     =00000000      79        (2)
DS$LOAD           00010198      80        (2)
DS$LOADPCS        000101C0      80        (2)
DS$MAPDBGBLOCK    00010118      80        (2)
DS$MMOFF          00010158      80        (2)
DS$MMON           00010150      80        (2)
DS$MOVPHY         00010148      80        (2)
DS$MOVVRT         00010140      80        (2)
DS$PARSE          000100B8      80        (2)
DS$PRINTB         000100E0      80        (2)
DS$PRINTF         000100F0      80        (2)
DS$PRINTS         000100F8      80        (2)
DS$PRINTSIG       00010100      80        (2)
DS$PRINTX         000100E8      80        (2)
DS$PROBE          000101A0      80        (2)
DS$RELBUF         00010128      80        (2)
DS$RELMEM         00010138      80        (2)
DS$SETIPL         00010178      80        (2)
DS$SETMAP         00010188      80        (2)
DS$SETPRIEXV      00010110      80        (2)
DS$SETVEC         00010160      80        (2)
DS$SHOCHAN        00010190      80        (2)
DS$SUMMARY        00010028      80        (2)
DS$WAITMS         00010060      80        (2)
DS$WAITUS         00010068      80        (2)
DS$_ARITH        =006600D0      79        (2)
DS$_BADLINK      =006600F0      79        (2)
DS$_BADTYPE      =006600E8      79        (2)
DS$_CHME         =006600A8      79        (2)
DS$_CHMK         =006600E0      79        (2)
DS$_DEVNAME      =00660108      79        (2)
DS$_ERROR        =00660002      79        (2)
DS$_FHWE         =00660068      79        (2)
DS$_FRAGBUF      =00660080      79        (2)
DS$_ICBUSY       =006600C8      79        (2)
DS$_ICERR        =006600C0      79        (2)
```

```
DS$_IHWE        =00660060     79      (2)
DS$_ILLCHAR     =00660018     79      (2)
DS$_ILLPAGCNT   =00660078     79      (2)
DS$_ILLUNIT     =00660100     79      (2)
DS$_INSFMEM     =00660050     79      (2)
DS$_IPL2HI      =006600B8     79      (2)
DS$_IVADDR      =00660040     79      (2)
DS$_IVVECT      =00660038     79      (2)
DS$_KRNLSTK     =00660090     79      (2)
DS$_LOGIC       =00660070     79      (2)
DS$_MCHK        =00660088     79      (2)
DS$_MMOFF       =00660058     79      (2)
DS$_NEEDUNIT    =006600F8     79      (2)
DS$_NOPCS       =00660110     79      (2)
DS$_NORMAL      =00660001     79      (2)
DS$_NOSUPPORT   =006600B1     79      (2)
DS$_NOTDON      =00660030     79      (2)
DS$_NOTIMP      =006600B0     79      (2)        79      (2)
DS$_NULLSTR     =00660010     79      (2)
DS$_OVERFLOW    =00660008     79      (2)
DS$_POWER       =00660098     79      (2)
DS$_PROGERR     =00660020     79      (2)
DS$_SEVERE      =00660004     79      (2)
DS$_TRANSL      =006600A0     79      (2)
DS$_TRUNCATE    =00660028     79      (2)
DS$_UNEXPINT    =006600D8     79      (2)
DS$_VASFULL     =00660048     79      (2)
DS$_WARNING     =00660000     79      (2)        79      (2)
ENV$M_DOMAIN    =00000002     58      (2)
ENV$M_LEVEL     =00000001     58      (2)
ENV$M_SUPER     =000003FC     58      (2)
ENV$S_DOMAIN    =00000001     58      (2)
ENV$S_LEVEL     =00000001     58      (2)
ENV$S_SUPER     =00000008     58      (2)
ENV$V_DOMAIN    =00000001     58      (2)        58      (2)
ENV$V_LEVEL     =00000000     58      (2)        58      (2)
ENV$V_SUPER     =00000002     58      (2)
ENV$_CPU        =00000000     58      (2)        58      (2)
ENV$_FUNCTIONAL=00000000      58      (2)        58      (2)
ENV$_REPAIR     =00000001     58      (2)        58      (2)
ENV$_SUPER      =00000001     58      (2)
ENV$_SYSTEM     =00000001     58      (2)        58      (2)
HALT            =00000004     81      (2)
IPR             =00000006     81      (2)
LDPCTX          =0000000B     81      (2)
MANUAL          =00000001     81      (2)
MCHK            =00000005     81      (2)
MEM             =00000009     81      (2)
MSG_002          00000002-R   92      (3)       103      (3)
POWER           =00000003     81      (2)
SCB$L_ACCESS     00000020     78      (2)
SCB$L_ARITH      00000034     78      (2)
SCB$L_BREAK      0000002C     78      (2)
SCB$L_CHME       00000044     78      (2)
SCB$L_CHMK       00000040     78      (2)
SCB$L_CHMS       00000048     78      (2)
SCB$L_CHMU       0000004C     78      (2)
```

```
SCB$L_COMPAT     00000030      78      (2)
SCB$L_KNLSTK     00000008      78      (2)
SCB$L_MACHCHK    00000004      78      (2)
SCB$L_OPCCUS     00000014      78      (2)
SCB$L_OPCDEC     00000010      78      (2)
SCB$L_POWER      0000000C      78      (2)
SCB$L_RADRMOD    0000001C      78      (2)
SCB$L_ROPRAND    00000018      78      (2)
SCB$L_RXDB       000000F8      78      (2)
SCB$L_SFTLVL1    00000084      78      (2)
SCB$L_SFTLVL10   000000A8      78      (2)
SCB$L_SFTLVL11   000000AC      78      (2)
SCB$L_SFTLVL12   000000B0      78      (2)
SCB$L_SFTLVL13   000000B4      78      (2)
SCB$L_SFTLVL14   000000B8      78      (2)
SCB$L_SFTLVL15   000000BC      78      (2)
SCB$L_SFTLVL2    00000088      78      (2)
SCB$L_SFTLVL3    0000008C      78      (2)
SCB$L_SFTLVL4    00000090      78      (2)
SCB$L_SFTLVL5    00000094      78      (2)
SCB$L_SFTLVL6    00000098      78      (2)
SCB$L_SFTLVL7    0000009C      78      (2)
SCB$L_SFTLVL8    000000A0      78      (2)
SCB$L_SFTLVL9    000000A4      78      (2)
SCB$L_TBIT       00000028      78      (2)
SCB$L_TIMER      000000C0      78      (2)
SCB$L_TRANSL     00000024      78      (2)
SCB$L_TXDB       000000FC      78      (2)
SCB$L_ZERO       00000000      78      (2)
SEP_FUNCTIONAL  =00000002      58      (2)
SEP_REPAIR      =00000003      58      (2)
SIZ...          =00000008      58      (2)        58      (2)
SYS$ALLOC        00010238      80      (2)
SYS$ASCTIM       00010248      80      (2)
SYS$ASSIGN       00010250      80      (2)
SYS$BINTIM       00010258      80      (2)
SYS$CANCEL       00010260      80      (2)
SYS$CANTIM       00010268      80      (2)
SYS$CLOSE        000105B8      80      (2)
SYS$CLREF        00010298      80      (2)
SYS$CONNECT      000105C0      80      (2)
SYS$DALLOC       000102D8      80      (2)
SYS$DASSGN       000102E0      80      (2)
SYS$DISCONNECT   000105D0      80      (2)
SYS$FAO          00010350      80      (2)
SYS$FAOL         00010358      80      (2)
SYS$GET          00010580      80      (2)
SYS$GETCHN       000104C8      80      (2)
SYS$GETTIM       00010378      80      (2)
SYS$LKWSET       000103A0      80      (2)
SYS$NUMTIM       000103B8      80      (2)
SYS$OPEN         00010608      80      (2)
SYS$QIO          000103C8      80      (2)
SYS$QIOW         00010200      80      (2)
SYS$READ         00010590      80      (2)
SYS$READEF       000103D0      80      (2)
SYS$SETAST       000103F8      80      (2)
```

```
SYS$SETEF        00010400     80     (2)
SYS$SETIMR       00010420     80     (2)
SYS$SETPRI       00010428     80     (2)
SYS$SETPRT       00010430     80     (2)
SYS$SETRWM       00010438     80     (2)
SYS$SETSWM       00010448     80     (2)
SYS$ULKPAG       00010460     80     (2)
SYS$ULWSET       00010468     80     (2)
SYS$UNWIND       00010470     80     (2)
SYS$WAITFR       00010478     80     (2)
SYS$WFLAND       00010488     80     (2)
SYS$WFLOR        00010490     80     (2)
T2_S1            00000022-R   117    (4)
T2_S1_X          0000002D-R   119    (4)
T2_S2            00000038-R   136    (5)
T2_S2_X          00000043-R   138    (5)
T2_S3            0000004E-R   155    (6)
T2_S3_X          00000059-R   157    (6)
T2_S4            00000064-R   172    (7)
T2_S4_X          0000006F-R   174    (7)
T2_S5            0000007A-R   189    (8)
T2_S5_X          00000085-R   191    (8)
T2_S6            00000090-R   205    (9)
T2_S6_X          0000009B-R   207    (9)
T2_S7            000000A6-R   223    (10)
T2_S7_X          000000B1-R   225    (10)
T2_S8            000000BC-R   239    (11)
T2_S8_X          000000C7-R   241    (11)
TEST_002         00000020-R   103    (3)       103     (3)
TEST_002_X       000000D5-R   245    (12)
TU58            =00000002     81     (2)
UBI             =0000000A     81     (2)
WCS             =00000007     81     (2)
```

```
                                                          H 14
ZZ-ENKAX-1.3     Cross reference                      30-JUN-1983          Fiche 1  Frame H14          Sequence 176
ENKAXB                           VAX-11/730 Specific CPU Cluster Exercise 30-JUN-1983 15:46:36  VAX-11 Macro V03-00         Page  21
Cross reference                                                           1-APR-1983 15:14:10  WRKD$0:[PAN.ENKAX]ENKAXB.MAR;71  (12)


                                          +-------------------------+
                                          ! Macros Cross Reference !
                                          +-------------------------+
MACRO            SIZE          DEFINITION       REFERENCES...
-----            ----          ----------       -------------
$D1_BSUBT        1             117     (4)      117    (4)      136    (5)      155    (6)      172    (7)      189    (8)
                                                205    (9)      223    (10)     239    (11)
$D1_BTEST        1             103     (3)      103    (3)
$D1_ESUBT        1             119     (4)      119    (4)      138    (5)      157    (6)      174    (7)      191    (8)
                                                207    (9)      225    (10)     241    (11)
$D1_ETEST        1             245     (12)     245    (12)
$D1_SBTTL        2             92      (3)      107    (4)      123    (5)      142    (6)      161    (7)      178    (8)
                                                195    (9)      211    (10)     229    (11)     92     (3)
$D2_BDATA        1             103     (3)      103    (3)
$D2_BTEST        1             103     (3)      103    (3)
$D2_SBTTL        1             92      (3)      92     (3)
$DEF             1             80      (2)      78     (2)      80     (2)
$DEFEND          1             78      (2)      78     (2)      80     (2)
$DEFINI          1             78      (2)      78     (2)      80     (2)
$DS_BGNMOD       1             58      (2)      58     (2)
$DS_BGNSUB       1             117     (4)      117    (4)      136    (5)      155    (6)      172    (7)      189    (8)
                                                205    (9)      223    (10)     239    (11)
$DS_BGNTEST      1             103     (3)      103    (3)
$DS_BREAK        1             245     (12)     245    (12)
$DS_DSDEF        2             79      (2)      79     (2)
$DS_DSSDEF       1             80      (2)      80     (2)
$DS_ENDDATA      1             103     (3)      103    (3)
$DS_ENDMOD       1             247     (12)     247    (12)
$DS_ENDSUB       1             119     (4)      119    (4)      138    (5)      157    (6)      174    (7)      191    (8)
                                                207    (9)      225    (10)     241    (11)
$DS_ENDTEST      1             245     (12)     245    (12)
$DS_ENVDEF       2             58      (2)      58     (2)
$DS_PAGE         1             90      (2)      105    (3)      121    (4)      140    (5)      159    (6)      176    (7)
                                                193    (8)      209    (9)      227    (10)     243    (11)     90     (2)
$DS_SBTTL        1             92      (3)      107    (4)      123    (5)      142    (6)      161    (7)      178    (8)
                                                195    (9)      211    (10)     229    (11)     92     (3)
$DS_SCBDEF       1             78      (2)      78     (2)
$DS_SECDEF       1             81      (2)      81     (2)
$EQU             1             80      (2)      58     (2)      79     (2)
$EQULS1          1             79      (2)      58     (2)      79     (2)
$EQULST          1             58      (2)      58     (2)      79     (2)
$GBLINI          2             58      (2)      58     (2)      78     (2)      79     (2)      80     (2)
$VIELD           1             58      (2)      58     (2)
$VIELD1          1             80      (2)      58     (2)
ENKAX_SECDEF     1             81      (2)      81     (2)

                                          +-------------------------+
                                          ! Performance indicators !
                                          +-------------------------+
Phase                     Page faults    CPU Time       Elapsed Time
-----                     -----------    --------       ------------
Initialization                     27    00:00:00.03    00:00:00.32
Command processing                 23    00:00:00.18    00:00:00.48
Pass 1                            776    00:00:07.50    00:00:17.89
```

```
Symbol table sort                  7      00:00:00.25     00:00:00.51
Pass 2                           149      00:00:01.22     00:00:02.78
Symbol table output               23      00:00:00.14     00:00:00.16
Psect synopsis output              6      00:00:00.04     00:00:00.23
Cross-reference output           100      00:00:01.03     00:00:02.63
Assembler run totals            1115      00:00:10.41     00:00:25.01

The working set limit was 750 pages.
55908 bytes (110 pages) of virtual memory were used to buffer the intermediate code.
There were 20 pages of symbol table space allocated to hold 236 non-local and 0 local symbols.
249 source lines were read in Pass 1, producing 22 object records in Pass 2.
65 pages of virtual memory were used to define 28 macros.

                                             +----------------------------+
                                             ! Macro library statistics !
                                             +----------------------------+
Macro library name                            Macros defined
------------------                            --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                              1
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                           23
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                           5
TOTALS (all libraries)                                     29

527 GETS were required to define 29 macros.

There were no errors, warnings or information messages.

/LIS/CRO ENKAXB
```

Table of contents

```
    (1)        1         ENKAXC: POWER FAIL
    (3)       57         DECLARATIONS
    (4)      122         INSTRUCTION MESSAGES
    (4)      146         ERROR MESSAGES
    (5)      184         SUBROUTINES
    (6)      318         TEST 2:    POWER FAIL
    (7)      358         SUBTEST 2.1:   GOOD RPB SUBTEST
    (8)      414         SUBTEST 2.2:   SEARCH FOR GOOD RPB
    (9)      479         SUBTEST 2.3:   BAD CHECKSUM SUBTEST
```

```
0000            .SBTTL  ENKAXC: POWER FAIL
0000            .TITLE  ENKAXC  VAX-11/730 Specific CPU Cluster Exerciser
0000            .IDENT  /1-3/
0000
0000    ;
0000    ; Copyright (C) 1981
0000    ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000    ;
0000    ; This software is furnished  under a license for use only on a single
0000    ; computer  system and  may be  copied only with  the inclusion of the
0000    ; above copyright notice.  This software, or any other copies thereof,
0000    ; may not be provided or  otherwise made available to any other person
0000    ; except for use on such system and to one who agrees to these license
0000    ; terms.  Title to and  ownership of the  software  shall at all times
0000    ; remain in DEC.
0000    ;
0000    ; The information in this software is subject to change without notice
0000    ; and should  not be construed  as a commitment  by Digital  Equipment
0000    ; Corporation.
0000    ;
0000    ; DEC assumes  no  responsibility  for  the use or  reliability of its
0000    ; software on equipment which is not supplied by DEC.
0000    ;
0000
0000    ;++
0000    ; Facility:       VAX Architecture Diagnostic.
0000    ;
0000    ; Abstract:       This module tests that the VAX-11/730 power failure and
0000    ;                 recovery mechanism functions properly.  The power fail
0000    ;                 tests instruct the operator to select console panel switch
0000    ;                 settings and force various power interruptions.
0000    ;
0000    ;
0000    ; Environment:    VAX Diagnostic Supervisor.
0000    ;
0000    ; Author:         Rich Lewis      7-Jly-81        Version 1.0
0000    ;
0000    ;                 Tai-Chun Pan    01-Apr-83       Version 1.2
0000    ;
0000    ;                 Added quick flag on Test 7(TU58). If quick flag is set
0000    ;                 will skip subtest 4 through subtest 11.  Added event flag 3.
0000    ;                 If event flag 3 is set, will override protection,
0000    ;                 i.e., go ahead and write on tape.  If run APT & event flag 3
0000    ;                 is clear & tape is not scratch, will report an error.
0000    ;                 Modified Unibus sizer on Test 8 & 9. make test run faster.
0000    ;
0000    ;
0000    ;                 Tai-Chun Pan    03-Aug-83       Version 1.3
0000    ;
0000    ;                 fixed bugs on TEST 7 and error summary routine call when
0000    ;                 running under APT.
0000    ;
0000    ;
0000    ;--
```

```
                0000
                0000           .SBTTL  DECLARATIONS
                0000           .LIST   MEB
                0000           .NLIST  CND
            00000000           .PSECT  ENKAXC, PAGE, NOWRT
                0000           .LIBRARY        "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                0000           $DS_BGNMOD      CEP_REPAIR, TN=2
                0000    ;;;    Macro-32 Diagnostic macro library Version 6.10 'DIAG.MLB (137)'
                0000
                0000    ;
                0000    ; Include files:
                0000    ;
                0000
                0000           .LIBRARY        "ENKAX"                 ; CPU Cluster Exerciser library.
                0000
                0000    ;
                0000    ; Macros:
                0000    ;
                0000
                0000           $DS_SCBDEF
                0000           $DS_DSDEF
                0000           $DS_DSSDEF
                0000           $DS_PSLDEF
                0000           .SAVE   LOCAL_BLOCK
                0000           .PSECT  $ABS$,ABS
    00000000    0610           .=0
            00000000           .RESTORE
                0000           $DS_PARDEF
                0000
                0000           ENKAX_SECDEF
                0000
                0000
                0000    ;
                0000    ; Own storage:
                0000    ;
                0000
    00000004    0000    L_BUF_BEGIN:    .BLKL   1       ; address of data stored on power failure
    00000008    0004    L_COUNT:        .BLKL   1       ; counter
    0000000C    0008    L_CHECKSUM:     .BLKL   1       ; contains good RPB checksum
    00000010    000C    L_CHECKSUM1:    .BLKL   1       ; contains error RPB checksum
    00000014    0010    L_PSL:          .BLKL   1       ; used to store PSL
    00000018    0014    L_IS_SP:        .BLKL   1       ; used to store interrupt SP
    0000001C    0018    L_KS_SP:        .BLKL   1       ; used to store kernel SP
                001C
    0000001D    001C    B_RESPONSE:     .BLKB   1       ; message response byte
    0000001E    001D    B_FLAGS:        .BLKB   1       ; byte to keep power up and down done flags
    0000001F    001E    B_FLAGS2:       .BLKB   1       ; byte to keep stack and mode flags
                001F
    00000000    001F    V_PWRDN_DONE=0                  ; power down done position in flags
    00000001    001F    M_PWRDN_DONE=1@0                ; power down done mask in flags
    00000001    001F    V_PWRUP_DONE=1                  ; power up done position in flags
    00000002    001F    M_PWRUP_DONE=1@1                ; power up done mask in flags
    00000002    001F    V_BAD_PC=2                      ; incorrect pc position in flags
    00000004    001F    M_BAD_PC=1@2                    ; incorrect pc mask in flags
                001F
    00000000    001F    V_BADMODE_DN=0                  ; bad mode on power down position in flags2
    00000001    001F    M_BADMODE_DN=1@0                ; bad mode on power down mask in flags2
```

```
                  00000001  001F    108 V_BADMODE_UP=1                      ; bad mode on power up position in flags2
                  00000002  001F    109 M_BADMODE_UP=1@1                    ; bad mode on power up mask in flags2
                  00000002  001F    110 V_BADSTACK_DN=2                     ; bad stack on power down position in flags2
                  00000004  001F    111 M_BADSTACK_DN=1@2                   ; bad stack on power down mask in flags2
                  00000003  001F    112 V_BADSTACK_UP=3                     ; bad stack on power up position in flags2
                  00000008  001F    113 M_BADSTACK_UP=1@3                   ; bad stack on power up mask in flags2
                  00000004  001F    114 V_PWRUP_ERR=4                       ; power up error position in flags2
                  00000010  001F    115 M_PWRUP_ERR=1@4                     ; power up error mask in flags2
                            001F    116
                            001F    117
        000004A0'9F     17  001F    118 JUMP:   JMP     @#POWER_UP          ; used to load instruction at loc 100 to
                            0025    119                                     ; restart from subtests which halt
                  00000100  0025    120 STRTUP=^X100                        ; label for loc 100
```

```
                                      0025    122 .SBTTL  INSTRUCTION MESSAGES
                                      0025    123 ;-------------------------------------------------------------------------
                                      0025    124 T_NO_KA730:
65 63 69 76 65 64 20 6F 4E 2F 21 00'  0025    125         .ASCIC  "!/No device of type KA730 selected.  Exiting test.!/"
37 41 4B 20 65 70 79 74 20 66 6F 20   0031
2E 64 65 74 63 65 6C 65 73 20 30 33   003D
65 74 20 67 6E 69 74 69 78 45 20 20   0049
               2F 21 2E 74 73         0055
                              34      0025
                                      005A    126 ;-------------------------------------------------------------------------
                                      005A    127 T_INST:
6F 63 20 65 72 6F 66 65 42 2F 21 00'  005A    128         .ASCIC  "!/Before continuing, set the AUTO RESTART switch to ON!/"
65 73 20 2C 67 6E 69 75 6E 69 74 6E   0066
52 20 4F 54 55 41 20 65 68 74 20 74   0072
63 74 69 77 73 20 54 52 41 54 53 45   007E
      2F 21 4E 4F 20 6F 74 20 68      008A
                              38      005A
                                      0093    129 ;-------------------------------------------------------------------------
                                      0093    130 T_MESSAGE_1:
74 73 65 52 20 64 6F 6F 47 2F 21 00'  0093    131         .ASCIC  "!/Good Restart Parameter Block Subtest - This subtest!/"-
65 74 65 6D 61 72 61 50 20 74 72 61   009F
74 62 75 53 20 6B 63 6F 6C 42 20 72   00AB
73 20 73 69 68 54 20 2D 20 74 73 65   00B7
6C 6C 69 77 2F 21 74 73 65 74 62 75   00C3
73 74 69 20 74 72 61 74 73 65 72 20   00CF
52 20 65 68 74 20 66 69 20 66 6C 65   00DB
72 65 70 6F 72 70 20 73 69 20 42 50   00E7
74 65 72 70 72 65 74 6E 69 20 79 6C   00F3
               2F 21 2E 64 65         00FF
                                      0104    132                 "will restart itself if the RPB is properly interpreted.!/"-
49 57 53 20 59 45 4B 20 6E 72 75 54   0104    133                 "Turn KEY SWITCH to STAND BY or open BREAKER momentarily..."
44 4E 41 54 53 20 6F 74 20 48 43 54   0110
20 6E 65 70 6F 20 72 6F 20 59 42 20   011C
65 6D 6F 6D 20 52 45 4B 41 45 52 42   0128
      2E 2E 2E 79 6C 69 72 61 74 6E   0134
                              AA      0093
                                      013E    134 ;-------------------------------------------------------------------------
                                      013E    135 T_MESSAGE_2:
6B 63 65 68 43 20 64 61 42 2F 21 00'  013E    136         .ASCIC  "!/Bad Checksum Subtest - This subtest will restart itself!/"-
20 74 73 65 74 62 75 53 20 6D 75 73   014A
65 74 62 75 73 20 73 69 68 54 20 2D   0156
74 73 65 72 20 6C 6C 69 77 20 74 73   0162
2F 21 66 6C 65 73 74 69 20 74 72 61   016E
69 20 42 50 52 20 65 68 74 20 66 69   017A    137                 "if the RPB is properly interpreted.!/"-
69 20 79 6C 72 65 70 6F 72 70 20 73   0186
21 2E 64 65 74 65 72 70 72 65 74 6E   0192
                              2F      019E
49 57 53 20 59 45 4B 20 6E 72 75 54   019F    138                 "Turn KEY SWITCH to STAND BY or open BREAKER momentarily..."
44 4E 41 54 53 20 6F 74 20 48 43 54   01AB
20 6E 65 70 6F 20 72 6F 20 59 42 20   01B7
65 6D 6F 6D 20 52 45 4B 41 45 52 42   01C3
      2E 2E 2E 79 6C 69 72 61 74 6E   01CF
                              9A      013E
                                      01D9    139 ;-------------------------------------------------------------------------
                                      01D9    140 T_MESSAGE_3:
6F 66 20 68 63 72 61 65 53 2F 21 00'  01D9    141         .ASCIC  "!/Search for Good RPB - This subtest will restart itself!/"-
2D 20 42 50 52 20 64 6F 6F 47 20 72   01E5
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73 65 74 62 75 73 20 73 69 68 54 20  01F1
61 74 73 65 72 20 6C 6C 69 77 20 74  01FD
   2F 21 66 6C 65 73 74 69 20 74 72  0209
69 20 42 50 52 20 65 68 74 20 66 69  0214   142                "if the RPB is properly interpreted.!/"-
69 20 79 6C 72 65 70 6F 72 70 20 73  0220
21 2E 64 65 74 65 72 70 72 65 74 6E  022C
                                  2F  0238
49 57 53 20 59 45 4B 20 6E 72 75 54  0239   143                "Turn KEY SWITCH to STAND BY or open BREAKER momentarily..."
44 4E 41 54 53 20 6F 74 20 48 43 54  0245
20 6E 65 70 6F 20 72 6F 20 59 42 20  0251
65 6D 6F 6D 20 52 45 4B 41 45 52 42  025D
         2E 2E 2E 79 6C 69 72 61 74 6E  0269
                                  99  01D9
                                      0273   144 ;----------------------------------------------------------------------
                                      0273   145
                                      0273   146 .SBTTL  ERROR MESSAGES
                                      0273   147 ;----------------------------------------------------------------------
                                      0273   148 T_PWRDN_ERROR:
20 6E 77 6F 64 20 72 65 77 6F 50 00'  0273   149          .ASCIC  'Power down sequence did not complete'
64 69 64 20 65 63 6E 65 75 71 65 73  027F
74 65 6C 70 6D 6F 63 20 74 6F 6E 20  028B
                                  65  0297
                                  24  0273
                                      0298   150
                                      0298   151 ;----------------------------------------------------------------------
                                      0298   152 T_PWRUP_ERROR:
65 73 20 70 75 20 72 65 77 6F 50 00'  0298   153          .ASCIC  'Power up sequence did not complete'
6E 20 64 69 64 20 65 63 6E 65 75 71  02A4
   65 74 65 6C 70 6D 6F 63 20 74 6F  02B0
                                  22  0298
                                      02BB   154
                                      02BB   155 ;----------------------------------------------------------------------
                                      02BB   156 T_BADMODE:
20 65 64 6F 6D 20 67 6E 6F 72 57 00'  02BB   157          .ASCIC  'Wrong mode in PSL for power down and up'
70 20 72 6F 66 20 4C 53 50 20 6E 69  02C7
6E 61 20 6E 77 6F 64 20 72 65 77 6F  02D3
                         70 75 20 64  02DF
                                  27  02BB
                                      02E3   158
                                      02E3   159 ;----------------------------------------------------------------------
                                      02E3   160 T_BADMODE_DN:
20 65 64 6F 6D 20 67 6E 6F 72 57 00'  02E3   161          .ASCIC  'Wrong mode in PSL for power down sequence'
70 20 72 6F 66 20 4C 53 50 20 6E 69  02EF
65 73 20 6E 77 6F 64 20 72 65 77 6F  02FB
                   65 63 6E 65 75 71  0307
                                  29  02E3
                                      030D   162
                                      030D   163 ;----------------------------------------------------------------------
                                      030D   164 T_BADMODE_UP:
20 65 64 6F 6D 20 67 6E 6F 72 57 00'  030D   165          .ASCIC  'Wrong mode in PSL for power up sequence'
70 20 72 6F 66 20 4C 53 50 20 6E 69  0319
75 71 65 73 20 70 75 20 72 65 77 6F  0325
                         65 63 6E 65  0331
                                  27  030D
                                      0335   166
                                      0335   167 ;----------------------------------------------------------------------
                                      0335   168 T_BADSTACK:
```

```
73 20 74 70 75 72 72 65 74 6E 49 00' 0335   169          .ASCIC  "Interrupt stack not used for power down and up"
65 73 75 20 74 6F 6E 20 6B 63 61 74  0341
20 72 65 77 6F 70 20 72 6F 66 20 64  034D
   70 75 20 64 6E 61 20 6E 77 6F 64  0359
                                 2E  0335
                                     0364   170
                                     0364   171 ;----------------------------------------------------------------------
                                     0364   172 T_BADSTACK_DN:
73 20 74 70 75 72 72 65 74 6E 49 00' 0364   173          .ASCIC  "Interrupt stack not used for power down sequence"
65 73 75 20 74 6F 6E 20 6B 63 61 74  0370
20 72 65 77 6F 70 20 72 6F 66 20 64  037C
63 6E 65 75 71 65 73 20 6E 77 6F 64  0388
                                 65  0394
                                 30  0364
                                     0395   174
                                     0395   175 ;----------------------------------------------------------------------
                                     0395   176 T_BADSTACK_UP:
73 20 74 70 75 72 72 65 74 6E 49 00' 0395   177          .ASCIC  "Interrupt stack not used for power up sequence"
65 73 75 20 74 6F 6E 20 6B 63 61 74  03A1
20 72 65 77 6F 70 20 72 6F 66 20 64  03AD
   65 63 6E 65 75 71 65 73 20 70 75  03B9
                                 2E  0395
                                     03C4   178
                                     03C4   179 ;----------------------------------------------------------------------
                                     03C4   180 T_CHECKSUM_ERR:
61 62 20 68 74 69 77 20 42 50 52 00' 03C4   181          .ASCIC  "RPB with bad checksum used to restart"
75 20 6D 75 73 6B 63 65 68 63 20 64  03D0
61 74 73 65 72 20 6F 74 20 64 65 73  03DC
                              74 72  03E8
                                 25  03C4
                                     03EA   182 ;----------------------------------------------------------------------
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                                    03EA   184 .SBTTL  SUBROUTINES
                                    03EA   185
                                    03EA   186 ; This is the Power Fail interrupt service routine which is entered
                                    03EA   187 ; upon an interrupt due to loss of power. The internal processor
                                    03EA   188 ; registers, frame pointer, stack pointer, argument pointer and
                                    03EA   189 ; all general purpose registers are saved in memory before all power
                                    03EA   190 ; is lost. If this is completed sucessfully a flag is set and then
                                    03EA   191 ; this routine goes into a loop, waiting for power to be totaly lost.
                                    03EA   192
                                    03EA   193            .ALIGN  LONG
                                    03EC   194 POWER_DOWN:
         58   00000000'FF      DE   03EC   195            MOVAL   @A_PWR_BUFFER,R8              ; load R8 with address of buffer
                    FC19 CF    DC   03F3   196            MOVPSL  L_PSL                         ; save contents of the current PSL
                      02  18   EC   03F7   197            CMPV    #PSL$V_CURMOD,#PSL$S_CURMOD,-
         00         FC13 CF         03FA   198                    L_PSL,#PSL$K_KERNEL           ; check PSL for current mode = kernel
                      05       13   03FE   199            BEQL    1$                            ; br = kernel mode
              FC19 CF 01       88   0400   200            BISB2   #M_BADMODE_DN,B_FLAGS2        ; flag bad mode on power down
           15 FC06 CF 1A       E0   0405   201 1$:        BBS     #PSL$V_IS,L_PSL,2$            ; br = on interrupt stack
              FC0E CF 04       88   040B   202            BISB2   #M_BADSTACK_DN,B_FLAGS2       ; flag bad stack on power down
      FBFB CF   00000000'8F    DB   0410   203            MFPR    #PR$_ISP,L_IS_SP              ; save interrupt stack pointer
              FBFA CF 5E       D0   0419   204            MOVL    SP,L_KS_SP                    ; save kernel stack pointer
                      0E       11   041E   205            BRB     3$                            ; go save other processor registers
              FBEF CF 5E       D0   0420   206 2$:        MOVL    SP,L_IS_SP                    ; save interrupt stack pointer
      FBEA CF   00000000'8F    DB   0425   207            MFPR    #PR$_KSP,L_KS_SP              ; save kernel stack pointer
                   88 5C       D0   042E   208 3$:        MOVL    AP,(R8)+                      ; save AP
                   88 5D       D0   0431   209            MOVL    FP,(R8)+                      ; save FP
         88   00000000'8F      DB   0434   210            MFPR    #PR$_ESP,(R8)+                ; save processor registers
         88   00000000'8F      DB   043B   211            MFPR    #PR$_SSP,(R8)+
         88   00000000'8F      DB   0442   212            MFPR    #PR$_USP,(R8)+
         88   00000000'8F      DB   0449   213            MFPR    #PR$_SBR,(R8)+
         88   00000000'8F      DB   0450   214            MFPR    #PR$_SLR,(R8)+
         88   00000000'8F      DB   0457   215            MFPR    #PR$_PCBB,(R8)+
         88   00000000'8F      DB   045E   216            MFPR    #PR$_P0BR,(R8)+
         88   00000000'8F      DB   0465   217            MFPR    #PR$_P0LR,(R8)+
         88   00000000'8F      DB   046C   218            MFPR    #PR$_P1BR,(R8)+
         88   00000000'8F      DB   0473   219            MFPR    #PR$_P1LR,(R8)+
         88   00000000'8F      DB   047A   220            MFPR    #PR$_ASTLVL,(R8)+
         88   00000000'8F      DB   0481   221            MFPR    #PR$_SCBB,(R8)+
              FB73 CF 58       D0   0488   222            MOVL    R8,L_BUF_BEGIN                ; save address of data in memory
              FB8B CF 01       88   048D   223            BISB2   #M_PWRDN_DONE,B_FLAGS         ; set done flag
                                    0492   224 4$:        $DS_BREAK
       00010058 9F    6E       FA   0492                          CALLG   (SP), @#DS$BREAK
                      F7       11   0499   225            BRB     4$                            ; wait
                                    049B   226
                                    049B   227
                                    049B   228
                                    049B   229 ; This is the Power Up routine which is pointed to by either the Restart
                                    049B   230 ; Parameter Block (RPB) or is entered through the restart code when a
                                    049B   231 ; nonrecoverable power fail has occurred. This routine will restore all
                                    049B   232 ; of the information which was saved in the power down routine and also
                                    049B   233 ; sets a done flag to indicate that the power up sequence was sucessful.
                                    049B   234
                                    049B   235 POWER_UP_ERR:
              FB7E CF 10       C8   049B   236            BISL2   #M_PWRUP_ERR,B_FLAGS2         ; set error flag if starting here
                                    04A0   237 POWER_UP:
         58   FB5C CF          D0   04A0   238            MOVL    L_BUF_BEGIN,R8                ; load address of data
       00000000'8F    78       DA   04A5   239            MTPR    -(R8),#PR$_SCBB               ; load SCBB to handle any exceptions
```

```
              FB60 CF    DC  04AC   240          MOVPSL  L_PSL                       ; save current PSL
              02   18    EC  04B0   241          CMPV    #PSL$V_CURMOD,#PSL$S_CURMOD,-
         00   FB5A CF        04B3   242                  L_PSL,#PSL$K_KERNEL         ; check current mode = kernel
                   05    13  04B7   243          BEQL    1$                          ; br = current mode kernel
              FB60 CF    02  88  04B9   244          BISB2   #M_BADMODE_UP,B_FLAGS2  ; flag bad mode on power up
         15 FB4D CF      1A  E0  04BE   245 1$:      BBS     #PSL$V_IS,L_PSL,2$      ; br = on interrupt stack
              FB55 CF    08  88  04C4   246          BISB2   #M_BADSTACK_UP,B_FLAGS2 ; flag bad stack on power up
  00000000'8F    FB47 CF     DA  04C9   247          MTPR    L_IS_SP,#PR$_ISP        ; load interrupt SP
           5E    FB42 CF     D0  04D2   248          MOVL    L_KS_SP,SP              ; load kernel SP
                   17    11  04D7   249          BRB     3$                          ; restore other processor registers
  00000000'8F    FB37 CF     DA  04D9   250 2$:      MTPR    L_IS_SP,#PR$_ISP        ; load interrupt SP
           5E    FB2E CF     D0  04E2   251          MOVL    L_IS_SP,SP              ; load interrupt SP
  00000000'8F    FB2D CF     DA  04E7   252          MTPR    L_KS_SP,#PR$_KSP        ; load kernel SP
    00000000'8F       78     DA  04F0   253 3$:      MTPR    -(R8),#PR$_ASTLVL       ; restore other processor registers
    00000000'8F       78     DA  04F7   254          MTPR    -(R8),#PR$_P1LR
    00000000'8F       78     DA  04FE   255          MTPR    -(R8),#PR$_P1BR
    00000000'8F       78     DA  0505   256          MTPR    -(R8),#PR$_P0LR
    00000000'8F       78     DA  050C   257          MTPR    -(R8),#PR$_P0BR
    00000000'8F       78     DA  0513   258          MTPR    -(R8),#PR$_PCBB
    00000000'8F       78     DA  051A   259          MTPR    -(R8),#PR$_SLR
    00000000'8F       78     DA  0521   260          MTPR    -(R8),#PR$_SBR
    00000000'8F       78     DA  0528   261          MTPR    -(R8),#PR$_USP
    00000000'8F       78     DA  052F   262          MTPR    -(R8),#PR$_SSP
    00000000'8F       78     DA  0536   263          MTPR    -(R8),#PR$_ESP
             5D       78     D0  053D   264          MOVL    -(R8),FP                            ; restore FP
             5C       78     D0  0540   265          MOVL    -(R8),AP                            ; restore AP
                             0543   266
      22 FAD6 CF      00     E0  0543   267          BBS     #V_BADMODE_DN,B_FLAGS2,5$ ; br = bad mode on power down
      5A FAD0 CF      01     E1  0549   268          BBC     #V_BADMODE_UP,B_FLAGS2,9$ ; br = both modes good
                             054F   269          $DS_ERRHARD_S   UNIT=KA_UNIT_NO, MSGADR=T_BADMODE_UP
                   00        DD  054F                    PUSHL   #0
              FDB8 CF        DF  0551                    PUSHAL  T_BADMODE_UP
         00000000'EF         DD  0555                    PUSHL   KA_UNIT_NO
                   01        DD  055B                    PUSHL   #$ER
                             055D         ;;; TEST 2, SUBTEST 0, ERROR 1
    000100D0 9F       04     FB  055D                    CALLS   #$$M, @#DS$ERRHARD
                             0564   270          $DS_ABORT
    00010020 9F       6C     FA  0564                    CALLG   (AP), @#DS$ABORT
      1C FAAE CF      01     E1  056B   271 5$:      BBC     #V_BADMODE_UP,B_FLAGS2,7$ ; br = bad mode on power down only
                             0571   272          $DS_ERRHARD_S   UNIT=KA_UNIT_NO, MSGADR=T_BADMODE
                   00        DD  0571                    PUSHL   #0
              FD44 CF        DF  0573                    PUSHAL  T_BADMODE
         00000000'EF         DD  0577                    PUSHL   KA_UNIT_NO
                   02        DD  057D                    PUSHL   #$ER
                             057F         ;;; TEST 2, SUBTEST 0, ERROR 2
    000100D0 9F       04     FB  057F                    CALLS   #$$M, @#DS$ERRHARD
                             0586   273          $DS_ABORT
    00010020 9F       6C     FA  0586                    CALLG   (AP), @#DS$ABORT
                             058D   274 7$:      $DS_ERRHARD_S   UNIT=KA_UNIT_NO, MSGADR=T_BADMODE_DN
                   00        DD  058D                    PUSHL   #0
              FD50 CF        DF  058F                    PUSHAL  T_BADMODE_DN
         00000000'EF         DD  0593                    PUSHL   KA_UNIT_NO
                   03        DD  0599                    PUSHL   #$ER
                             059B         ;;; TEST 2, SUBTEST 0, ERROR 3
    000100D0 9F       04     FB  059B                    CALLS   #$$M, @#DS$ERRHARD
                             05A2   275          $DS_ABORT
    00010020 9F       6C     FA  05A2                    CALLG   (AP), @#DS$ABORT
```

```
        22 FA70 CF      02    E0  05A9    276 9$:     BBS     #V_BADSTACK_DN,B_FLAGS2,11$ ; br = bad stack on power down
        5A FA6A CF      03    E1  05AF    277         BBC     #V_BADSTACK_UP,B_FLAGS2,15$ ; br = both stacks good
                                  05B5    278         $DS_ERRHARD_S   UNIT=KA_UNIT_NO, MSGADR=T_BADSTACK_UP
                        00    DD  05B5                        PUSHL   #0
                FDDA CF       DF  05B7                        PUSHAL  T_BADSTACK_UP
           00000000'EF        DD  05BB                        PUSHL   KA_UNIT_NO
                        04    DD  05C1                        PUSHL   #$ER
                                  05C3            ;;; TEST 2, SUBTEST 0, ERROR 4
        000100D0 9F     04    FB  05C3                        CALLS   #$$M, @#DS$ERRHARD
                                  05CA    279         $DS_ABORT
        00010020 9F     6C    FA  05CA                        CALLG   (AP), @#DS$ABORT
         1C FA48 CF     03    E1  05D1    280 11$:    BBC     #V_BADSTACK_UP,B_FLAGS2,13$ ; br = bad stack power down only
                                  05D7    281         $DS_ERRHARD_S   UNIT=KA_UNIT_NO, MSGADR=T_BADSTACK
                        00    DD  05D7                        PUSHL   #0
                FD58 CF       DF  05D9                        PUSHAL  T_BADSTACK
           00000000'EF        DD  05DD                        PUSHL   KA_UNIT_NO
                        05    DD  05E3                        PUSHL   #$ER
                                  05E5            ;;; TEST 2, SUBTEST 0, ERROR 5
        000100D0 9F     04    FB  05E5                        CALLS   #$$M, @#DS$ERRHARD
                                  05EC    282         $DS_ABORT
        00010020 9F     6C    FA  05EC                        CALLG   (AP), @#DS$ABORT
                                  05F3    283 13$:    $DS_ERRHARD_S   UNIT=KA_UNIT_NO, MSGADR=T_BADSTACK_DN
                        00    DD  05F3                        PUSHL   #0
                FD6B CF       DF  05F5                        PUSHAL  T_BADSTACK_DN
           00000000'EF        DD  05F9                        PUSHL   KA_UNIT_NO
                        06    DD  05FF                        PUSHL   #$ER
                                  0601            ;;; TEST 2, SUBTEST 0, ERROR 6
        000100D0 9F     04    FB  0601                        CALLS   #$$M, @#DS$ERRHARD
                                  0608    284         $DS_ABORT
        00010020 9F     6C    FA  0608                        CALLG   (AP), @#DS$ABORT
             FA09 CF    02    88  060F    285 15$:    BISB2   #M_PWRUP_DONE,B_FLAGS      ; set done flag
00000000'8F   00000F03 8F     DA  0614    286         MTPR    #^XF03,#PR$_TXDB           ; clear warm start flag
                        02        061F    287         REI                                ; return to test
                                  0620    288
                                  0620    289
                                  0620    290 ; This routine will calculate the checksum for the power up routine to
                                  0620    291 ; be stored in the restart parameter block.
                                  0620    292 ;
                                  0620    293 ;       R6 contains the address of the power up routine
                                  0620    294 ;       R7 gets the checksum for that routine
                                  0620    295 ;
                                  0620    296
                                  0620    297 CALC_CHECKSUM:
                        54    D4  0620    298         CLRL    R4                         ; init R4 to store checksum
             F9DD CF    01    D0  0622    299         MOVL    #1,L_COUNT                 ; initialize counter
                   53   56    D0  0627    300         MOVL    R6,R3                      ; get address of power up routine
                   54   83    C0  062A    301 1$:     ADDL2   (R3)+,R4                   ; add long word checksum
          F7 F9D2 CF    1F    F3  062D    302         AOBLEQ  #^X1F,L_COUNT,1$           ; br = not finished
                   57   54    D0  0633    303         MOVL    R4,R7                      ; save checksum
                        05        0636    304         RSB                                ; return
                                  0637    305
                                  0637    306 ; This routine will clear the first page of buffer area.
                                  0637    307
                                  0637    308 CLEAR_BUFFER:
        55    00000000'FF     DE  0637    309         MOVAL   @A_BUFFER_BEGIN,R5         ; get starting buffer address
             F9C2 CF          D4  063E    310         CLRL    L_COUNT                    ; init counter
                        85    D4  0642    311 1$:     CLRL    (R5)+                      ; clear buffer location
```

```
     F4 F9B7 CF    00000080 8F    F3  0644    312          AOBLEQ  #128,L_COUNT,1$            ; br = not finished
                                  05  064E    313          RSB                                ; return
                                      064F    314
                                      064F    315
                                      064F    316          $DS_PAGE
```

```
                              064F                  .SBTTL  TEST 2:    POWER FAIL
                          00000000                  .PSECT  TEST_002, PAGE, NOWRT
                              0010
                              0010    319 ;++
                              0010    320 ; Test description:
                              0010    321 ;
                              0010    322 ;         This test consists of a series of manual operator intervention
                              0010    323 ;         subtests. These subtests will check that the Restart Parameter Block
                              0010    324 ;         (RPB) is recognizable and initiates the proper sequence of events
                              0010    325 ;         during and after a power failure. The power fail is induced by turning
                              0010    326 ;         the key switch on the front panel of the 11/730 to the STAND BY
                              0010    327 ;         position or by opening the BREAKER. With the battery backup on and the
                              0010    328 ;         select switch in the restart position a warm restart will be attempted
                              0010    329 ;         after the power is restored.
                              0010    330 ;
                              0010    331 ;
                              0010    332 ; Assumptions:
                              0010    333 ;
                              0010    334 ;         For this test to function properly the front panel AUTO RESTART
                              0010    335 ;         switch must be in the ON position and the battery backup must
                              0010    336 ;         be on.
                              0010    337 ;
                              0010    338 ;--
                              0010    339
                              0010    340           $DS_BGNTEST     <MANUAL,POWER,ALL>
                              0010        DATA_002:
                 00000000     0010                  .LONG   0                       ; TEST ARGUMENT TABLE TERMINATOR
                              0014        TEST_002::
                     0000     0014                  .WORD   ^M<>                    ; ENTRY MASK
                              0016    341
          00000000'EF    D5   0016    342           TSTL    KA_PTABLE                       ; CPU selected?
                   10    18   001C    343           BGEQ    5$                              ; br = CPU selected
                              001E    344           $DS_PRINTF_S    FORMAT=T_NO_KA730       ; print exit warning
          00000025'EF    9F   001E                          PUSHAB  T_NO_KA730
       000100F0 9F   01  FB   0024                          CALLS   #$$N, @#DS$PRINTF
                              002B    345           $DS_EXIT        TEST                    ; exit test
                 0248    31   002B                          BRW     TEST_002_X      ; EXIT TEST 2
                              002E    346 5$:
                              002E    347           $DS_SETVEC_S    VECTOR=#SCB$L_POWER, SRVADR=POWER_DOWN, CODE=#1
                   01    DD   002E                          PUSHL   #1
          000003EC'EF    DF   0030                          PUSHAL  POWER_DOWN
                   0C    DD   0036                          PUSHL   #SCB$L_POWER
       00010160 9F   03  FB   0038                          CALLS   #3, @#DS$SETVEC
00000000'8F   00000F03 8F    DA   003F    348           MTPR    #^XF03,#PR$_TXDB ; clear warm start flag
       56   000004A0'EF    DE   004A    349           MOVAL   POWER_UP,R6       ; load address of good power up routine
          00000620'EF    16   0051    350           JSB     CALC_CHECKSUM     ; calculate good checksum for RPB.
   00000008'EF     57    D0   0057    351           MOVL    R7,L_CHECKSUM     ; load checksum for good power up
       56   0000049B'EF    DE   005E    352           MOVAL   POWER_UP_ERR,R6 ; load address of error power up routine
          00000620'EF    16   0065    353           JSB     CALC_CHECKSUM     ; calculate good checksum for RPB.
   0000000C'EF     57    D0   006B    354           MOVL    R7,L_CHECKSUM1    ; load checksum for error power up
                              0072    355           $DS_PRINTF_S    FORMAT=T_INST
          0000005A'EF    9F   0072                          PUSHAB  T_INST
       000100F0 9F   01  FB   0078                          CALLS   #$$N, @#DS$PRINTF
                              007F    356           $DS_PAGE
```

```
                                   007F             .SBTTL  SUBTEST 2.1:  GOOD RPB SUBTEST
                                   007F   359 ;+
                                   007F   360 ; SUBTEST DESCRIPTION:
                                   007F   361 ;
                                   007F   362 ;         This subtest sets up a good RPB at location zero, which points to
                                   007F   363 ;         a power up routine that restores all pertinent processor registers,
                                   007F   364 ;         the argument pointer, frame pointer and stack pointer. The operator
                                   007F   365 ;         is instructed through the console terminal to turn the key switch
                                   007F   366 ;         on the front panel to the STAND BY position and then back to the local
                                   007F   367 ;         position or open the BREAKER to induce a CPU power failure. If the RPB
                                   007F   368 ;         is interpreted properly the instrucions for the next subtest will be
                                   007F   369 ;         printed on the console terminal. If an error occurred, either the
                                   007F   370 ;         processor will unexpectedly reboot or an error report will be generated
                                   007F   371 ;         by the diagnostic supervisor. This means the RPB was not recognized and
                                   007F   372 ;         a cold restart has been attempted.
                                   007F   373 ;
                                   007F   374 ;
                                   007F   375 ; SUBTEST STEPS:
                                   007F   376 ;
                                   007F   377 ;         SUBTEST GOOD RPB
                                   007F   378 ;         :  Setup good RPB at location 0
                                   007F   379 ;         :  Send instructions to operator
                                   007F   380 ;         :  Recover from power fail
                                   007F   381 ;         :  IF errors
                                   007F   382 ;         :  :  THEN REPORT errors
                                   007F   383 ;         :  ENDIF
                                   007F   384 ;         ENDSUBTEST GOOD RPB
                                   007F   385 ;
                                   007F   386 ;
                                   007F   387 ;
                                   007F   388 ;-
                                   007F   389
                                   007F   390         $DS_BGNSUB
                                   007F       T2_S1::
 00010030 9F   00000000'EF    FA   007F                         CALLG   $S$, @#DS$BGNSUB
               00000637'EF    16   008A   391         JSB     CLEAR_BUFFER     ; clear buffer area
               0000001D'EF    94   0090   392         CLRB    B_FLAGS          ; initialize flags
               0000001E'EF    94   0096   393         CLRB    B_FLAGS2         ; init flags2
                      55  00  D0   009C   394         MOVL    #0,R5            ; load address to build RPB
                      85  00  D0   009F   395         MOVL    #0,(R5)+         ; load first longword with the address
          85   000004A0'EF    DE   00A2   396         MOVAL   POWER_UP,(R5)+   ; load address of restart routine
          85   00000008'EF    D0   00A9   397         MOVL    L_CHECKSUM,(R5)+ ; load good restart routine checksum
                          65  D4   00B0   398         CLRL    (R5)             ; clear warm start flag
                                   00B2   399         $DS_PRINTF_S    FORMAT=T_MESSAGE_1
               00000093'EF    9F   00B2                         PUSHAB  T_MESSAGE_1
 000100F0 9F              01  FB   00B8                         CALLS   #$$N, @#DS$PRINTF
                                   00BF   400
                                   00BF   401 POWER_DOWN_1:
                                   00BF   402         $DS_BREAK
 00010058 9F              6E  FA   00BF                         CALLG   (SP), @#DS$BREAK
       02 0000001D'EF     01  E0   00C6   403         BBS     #V_PWRUP_DONE,B_FLAGS,1$ ; br = power up done
                      EF  11       00CE   404         BRB     POWER_DOWN_1     ; wait for power fail interrupt
                                   00D0   405
       1E 0000001D'EF     00  E0   00D0   406 1$:     BBS     #V_PWRDN_DONE,B_FLAGS,3$ ; br = power down sequence complete
                                   00D8   407         $DS_ERRHARD_S   UNIT=KA_UNIT_NO, MSGADR=T_PWRDN_ERROR
                          00  DD   00D8                         PUSHAL  #0
               00000273'EF    DF   00DA                         PUSHAL  T_PWRDN_ERROR
               00000000'EF    DD  00E0                          PUSHL    KA_UNIT_NO
                       01     DD  00E6                          PUSHL    #$ER
                                  00E8         ;;; TEST 2, SUBTEST 1, ERROR 1
          000100D0 9F  04     FB  00E8                          CALLS    #$$M, @#DS$ERRHARD
                                  00EF   408            $DS_ABORT
          00010020 9F  6C     FA  00EF                          CALLG    (AP), @#DS$ABORT
                                  00F6   409 3$:
                                  00F6   410            $DS_ENDSUB
                                  00F6         T2_S1_X:
     00010038 9F   00000000'EF    FA  00F6                          CALLG    $S$, @#DS$ENDSUB
                                  0101   411            $DS_PAGE
                                  0101   412
                                  0101                .SBTTL  SUBTEST 2.2:  SEARCH FOR GOOD RPB
                                  0101   415 ;+
                                  0101   416 ; SUBTEST DESCRIPTION:
                                  0101   417 ;
                                  0101   418 ;        This subtest clears the first 1F (^X) memory locations starting with
                                  0101   419 ;        zero to assure that the string of zeros at location 0 will not be
                                  0101   420 ;        misinterpreted as a RPB even though all zeros fills basic criteria for
                                  0101   421 ;        a RPB (i.e., the starting address and checksum of all zeros would be
                                  0101   422 ;        good).  It also sets up a good RPB at a higher page boundary which
                                  0101   423 ;        points to a power up routine that restores all pertinent processor
                                  0101   424 ;        registers, the argument pointer, frame pointer and stack pointer.
                                  0101   425 ;        This will test a search through memory to find a valid RPB.
                                  0101   426 ;        The operator is instructed through the console terminal to turn the
                                  0101   427 ;        key switch on the front panel to the STAND BY position or open the
                                  0101   428 ;        BREAKER to induce a CPU power failure. If location zero is misinter-
                                  0101   429 ;        preted as a RPB the processor will halt with code = 1. If the real RPB
                                  0101   430 ;        is interpreted properly the next subtest instructions will be printed
                                  0101   431 ;        on the console terminal. If an error occurred, either the processor
                                  0101   432 ;        will reboot unexpectedly or an error report will be generated by the
                                  0101   433 ;        diagnostic supervisor.
                                  0101   434 ;
                                  0101   435 ;
                                  0101   436 ; SUBTEST STEPS:
                                  0101   437 ;
                                  0101   438 ;        SUBTEST SEARCH FOR GOOD RPB
                                  0101   439 ;        :  Clear first 1F (X) locations
                                  0101   440 ;        :  Setup good RPB at higher page boundary
                                  0101   441 ;        :  Send instructions to operator
                                  0101   442 ;        :  Recover frcm Power Fail
                                  0101   443 ;        :  IF any errors
                                  0101   444 ;        :  :  THEN REPORT errors
                                  0101   445 ;        :  ENDIF
                                  0101   446 ;        ENDSUBTEST SEARCH FOR GOOD RPB
                                  0101   447 ;
                                  0101   448 ;
                                  0101   449 ;-
                                  0101   450
                                  0101   451          $DS_BGNSUB
                                  0101       T2_S2::
00010030 9F    0000000C'EF    FA  0101                         CALLG   $S$, @#DS$BGNSUB
               00000637'EF    16  010C   452          JSB     CLEAR_BUFFER    ; clear buffer area
               0000001D'EF    94  0112   453          CLRB    B_FLAGS         ; initialize flags
               0000001E'EF    94  0118   454          CLRB    B_FLAGS2        ; init flags2
                        54    D4  011E   455          CLRL    R4              ; init counter
                   55   00    D0  0120   456          MOVL    #0,R5           ; load address to start clearing
                        85    7C  0123   457 1$:      CLRQ    (R5)+           ; clear a quad word
                FA 54   10    F3  0125   458          AOBLEQ  #16,R4,1$       ; br = not finished
           55  00000000'FF    DE  0129   459          MOVAL   @A_BUFFER_BEGIN,R5 ; load address to build good RPB
           85  00000000'FF    DE  0130   460          MOVAL   @A_BUFFER_BEGIN,(R5)+ ; load first longword with the address
           85  000004A0'EF    DE  0137   461          MOVAL   POWER_UP,(R5)+  ; load address of restart routine
           85  00000008'EF    D0  013E   462          MOVL    L_CHECKSUM,(R5)+ ; load good restart routine checksum
                        65    D4  0145   463          CLRL    (R5)            ; clear warm start flag
                                  0147   464          $DS_PRINTF_S    FORMAT=T_MESSAGE_3
               000001D9'EF    9F  0147                         PUSHAB  T_MESSAGE_3
      000100F0 9F       01    FB  014D                         CALLS   #$$N, @#DS$PRINTF
                                  0154   465
                                  0154   466 POWER_DOWN_2:
                                   0154    467            $DS_BREAK
         00010058 9F      6E   FA  0154                              CALLG   (SP), @#DS$BREAK
      02 0000001D'EF      01   E0  015B    468            BBS        #V_PWRUP_DONE,B_FLAGS,1$ ; br = power up sequence complete
                          EF   11  0163    469            BRB        POWER_DOWN_2    ; wait for power fail interrupt
                                   0165    470
      1E 0000001D'EF      00   E0  0165    471 1$:        BBS        #V_PWRDN_DONE,B_FLAGS,3$ ; br = power down sequence complete
                                   016D    472            $DS_ERRHARD_S    UNIT=KA_UNIT_NO, MSGADR=T_PWRDN_ERROR
                          00   DD  016D                              PUSHL   #0
              00000273'EF      DF  016F                              PUSHAL  T_PWRDN_ERROR
              00000000'EF      DD  0175                              PUSHL   KA_UNIT_NO
                          01   DD  017B                              PUSHL   #$ER
                                   017D               ;;; TEST 2, SUBTEST 2, ERROR 1
         000100D0 9F      04   FB  017D                              CALLS   #$$M, @#DS$ERRHARD
                                   0184    473            $DS_ABORT
         00010020 9F      6C   FA  0184                              CALLG   (AP), @#DS$ABORT
                                   018B    474 3$:
                                   018B    475            $DS_ENDSUB
                                   018B               T2_S2_X:
   00010038 9F    0000000C'EF  FA  018B                              CALLG   $S$, @#DS$ENDSUB
                                   0196    476
                                   0196    477            $DS_PAGE
```

```
                                     0196           .SBTTL  SUBTEST 2.3:  BAD CHECKSUM SUBTEST
                                     0196      ;+
                                     0196      ; SUBTEST DESCRIPTION:
                                     0196      ;
                                     0196      ;        This subtest sets up a RPB at location zero with a bad checksum.
                                     0196      ;        It points to a power up routine that restores all pertinent processor
                                     0196      ;        registers, the argument pointer, frame pointer and stack pointer and
                                     0196      ;        will set an error flag indicating that the checksum did not invalidate
                                     0196      ;        the RPB. Further into memory a good RPB will be located to warm restart
                                     0196      ;        normally without setting an error flag (this prevents an auto cold
                                     0196      ;        start). The operator is instructed through the console terminal to turn
                                     0196      ;        the key switch on the front panel to the STAND BY position or open the
                                     0196      ;        BREAKER to induce a CPU power failure. If the second RPB is not inter-
                                     0196      ;        preted properly, the system will attempt a cold restart and boot. If
                                     0196      ;        the RPB with the bad checksum causes the warm start an error will be
                                     0196      ;        reported.
                                     0196      ;
                                     0196      ;
                                     0196      ; SUBTEST STEPS:
                                     0196      ;
                                     0196      ;        SUBTEST BAD CHECKSUM
                                     0196      ;        :   Setup RPB at location 0 with bad checksum
                                     0196      ;        :   Setup good RPB at higher page boundary
                                     0196      ;        :   Send instructions to operator
                                     0196      ;        :   Recover from  power fail
                                     0196      ;        :   IF errors
                                     0196      ;        :   :   THEN REPORT errors
                                     0196      ;        :   ENDIF
                                     0196      ;        ENDSUBTEST BAD CHECKSUM
                                     0196      ;
                                     0196      ;
                                     0196      ;-
                                     0196
                                     0196           $DS_BGNSUB
                                     0196      T2_S3::
  00010030 9F    00000018'EF     FA  0196                   CALLG   $S$, @#DS$BGNSUB
                 00000637'EF     16  01A1           JSB     CLEAR_BUFFER      ; clear buffer area
                 0000001D'EF     94  01A7           CLRB    B_FLAGS           ; initialize flags
                 0000001E'EF     94  01AD           CLRB    B_FLAGS2          ; init flags2
                          55  00 D0  01B3           MOVL    #0,R5             ; load address to build RPB
                          85  00 D0  01B6           MOVL    #0,(R5)+          ; load first longword with the address
            85   0000049B'EF     DE  01B9           MOVAL   POWER_UP_ERR,(R5)+ ; load address of restart routine
            65   0000000C'EF     D0  01C0           MOVL    L_CHECKSUM1,(R5) ; load error restart routine checksum
                          85  01 C2  01C7           SUBL2   #1,(R5)+          ; make the checksum bad
                              65 D4  01CA           CLRL    (R5)              ; clear warm start flag
            55   00000000'FF     DE  01CC           MOVAL   @A_BUFFER_BEGIN,R5 ; load address to build good RPB
            85   00000000'FF     DE  01D3           MOVAL   @A_BUFFER_BEGIN,(R5)+ ; load first longword with the address
            85   000004A0'EF     DE  01DA           MOVAL   POWER_UP,(R5)+    ; load address of restart routine
            85   00000008'EF     D0  01E1           MOVL    L_CHECKSUM,(R5)+ ; load good restart routine checksum
                              65 D4  01E8           CLRL    (R5)              ; clear warm start flag
  00000100'EF    0000001F'EF     B0  01EA           MOVW    JUMP,STRTUP       ; load addr 100 with JMP to POWER_UP to restart
                                     01F5           $DS_PRINTF_S    FORMAT=T_MESSAGE_2
                 0000013E'EF     9F  01F5                   PUSHAB  T_MESSAGE_2
       000100F0 9F    01         FB  01FB                   CALLS   #$$N, @#DS$PRINTF
                                     0202
                                     0202      POWER_DOWN_3:
                                     0202           $DS_BREAK
```

```
          00010058 9F      6E    FA  0202                         CALLG   (SP), @#DS$BREAK
       02 0000001D'EF      01    E0  0209   532          BBS      #V_PWRUP_DONE,B_FLAGS,1$ ; br = power up sequence complete
                           EF    11  0211   533          BRB      POWER_DOWN_3     ; wait for power fail interrupt
                                     0213   534
       1E 0000001E'EF      04    E1  0213   535 1$:      BBC      #V_PWRUP_ERR,B_FLAGS2,2$ ; br = restart was from good RPB
                                     021B   536          $DS_ERRHARD_S    UNIT=KA_UNIT_NO, MSGADR=T_CHECKSUM_ERR
                           00    DD  021B                         PUSHL   #0
                000003C4'EF      DF  021D                         PUSHAL  T_CHECKSUM_ERR
                00000000'EF      DD  0223                         PUSHL   KA_UNIT_NO
                           01    DD  0229                         PUSHL   #$ER
                                     022B       ;;; TEST 2, SUBTEST 3, ERROR 1
          000100D0 9F      04    FB  022B                         CALLS   #$$M, @#DS$ERRHARD
                                     0232   537          $DS_ABORT
          00010020 9F      6C    FA  0232                         CALLG   (AP), @#DS$ABORT
       1E 0000001D'EF      00    E0  0239   538 2$:      BBS      #V_PWRDN_DONE,B_FLAGS,3$ ; br = power down sequence complete
                                     0241   539          $DS_ERRHARD_S    UNIT=KA_UNIT_NO, MSGADR=T_PWRDN_ERROR
                           00    DD  0241                         PUSHL   #0
                00000273'EF      DF  0243                         PUSHAL  T_PWRDN_ERROR
                00000000'EF      DD  0249                         PUSHL   KA_UNIT_NO
                           02    DD  024F                         PUSHL   #$ER
                                     0251       ;;; TEST 2, SUBTEST 3, ERROR 2
          000100D0 9F      04    FB  0251                         CALLS   #$$M, @#DS$ERRHARD
                                     0258   540          $DS_ABORT
          00010020 9F      6C    FA  0258                         CALLG   (AP), @#DS$ABORT
                                     025F   541 3$:
                                     025F   542          $DS_ENDSUB
                                     025F       T2_S3_X:
 00010038 9F     00000018'EF     FA  025F                         CALLG   $S$, @#DS$ENDSUB
                                     026A   543
                                     026A   544          $DS_CLRVEC_S     VECTOR=#SCB$L_POWER
                           0C    DD  026A                         PUSHL   #SCB$L_POWER
          00010168 9F      01    FB  026C                         CALLS   #1, @#DS$CLRVEC
                                     0273   545
                                     0273   546          $DS_ENDTEST
                     50    01    D0  0273                         MOVL    #1, R0            ; NORMAL EXIT
                                     0276       TEST_002_X::
          00010058 9F      6E    FA  0276                         CALLG   (SP), @#DS$BREAK
                                 04  027D                         RET                       ; RETURN TO TEST SEQUENCER
                                     027E   547
                                     027E   548          $DS_ENDMOD
                           00000000                               .PSECT  $TSTCNT, NOEXE, NOWRT, OVR, LONG
                   00000002  0000                                 .LONG   $TN
                                     0004   549
                                     0004   550          .END
```

```
$$$               = 00000018 R      06    DS$K_NORMAL      = 00000001              DS$_NULLSTR      = 00660010
$$E               = 00000001              DS$K_SEVERE      = 00000004              DS$_OVERFLOW     = 00660008
$$M               = 00000004              DS$K_SUBSYS      = 00000066              DS$_POWER        = 00660098
$$N               = 00000000              DS$K_WARNING     = 00000000              DS$_PROGERR      = 00660020
$$S               = FFFFFFFF              DS$LOAD            00010198              DS$_SEVERE       = 00660004
$ENV              = 00000001  G           DS$LOADPCS         000101C0              DS$_TRANSL       = 006600A0
$ER               = FFFFFFFF              DS$MAPDBGBLOCK     00010118              DS$_TRUNCATE     = 00660028
$MO               = 00000001  G           DS$MMOFF           00010158              DS$_UNEXPINT     = 006600D8
$S$               = 00000018 R      06    DS$MMON            00010150              DS$_VASFULL      = 00660048
$ST               = 00000000              DS$MOVPHY          00010148              DS$_WARNING      = 00660000
$TN               = 00000002              DS$MOVVRT          00010140              ENV$M_DOMAIN     = 00000002
ALL               = 00000008  G           DS$PARSE           000100B8              ENV$M_LEVEL      = 00000001
A_BUFFER_BEGIN      *********   X   02    DS$PRINTB          000100E0              ENV$M_SUPER      = 000003FC
A_PWR_BUFFER        *********   X   02    DS$PRINTF          000100F0              ENV$S_DOMAIN     = 00000001
BASE_002            00000000 R      04    DS$PRINTS          000100F8              ENV$S_LEVEL      = 00000001
BIT...            = 00000005              DS$PRINTSIG        00010100              ENV$S_SUPER      = 00000008
B_FLAGS             0000001D R      02    DS$PRINTX          000100E8              ENV$V_DOMAIN     = 00000001
B_FLAGS2            0000001E R      02    DS$PROBE           000101A0              ENV$V_LEVEL      = 00000000
B_RESPONSE          0000001C R      02    DS$RELBUF          00010128              ENV$V_SUPER      = 00000002
CALC_CHECKSUM       00000620 R      02    DS$RELMEM          00010138              ENV$_CPU         = 00000000
CEP_FUNCTIONAL    = 00000000              DS$SETIPL          00010178              ENV$_FUNCTIONAL= 00000000
CEP_REPAIR        = 00000001              DS$SETMAP          00010188              ENV$_REPAIR      = 00000001
CLEAR_BUFFER        00000637 R      02    DS$SETPRIEXV       00010110              ENV$_SUPER       = 00000001
DATA_002            00000010 R      04    DS$SETVEC          00010160              ENV$_SYSTEM      = 00000001
DEFAULT           = 00000000  G           DS$SHOCHAN         00010190              HALT             = 00000004  G
DS$ABORT            00010020              DS$SUMMARY         00010028              IPR              = 00000006  G
DS$ASKADR           00010090              DS$WAITMS          00010060              JUMP               0000001F R      02
DS$ASKDATA          00010080              DS$WAITUS          00010068              KA_PTABLE          *********   X   04
DS$ASKLGCL          00010098              DS$_ARITH        = 006600D0              KA_UNIT_NO         *********   X   02
DS$ASKSTR           000100A0              DS$_BADLINK      = 006600F0              LDPCTX           = 0000000B  G
DS$ASKVLD           00010088              DS$_BADTYPE      = 006600E8              L_BUF_BEGIN        00000000 R      02
DS$ATTACH           000101A8              DS$_CHME         = 006600A8              L_CHECKSUM         00000008 R      02
DS$BGNSUB           00010030              DS$_CHMK         = 006600E0              L_CHECKSUM1        0000000C R      02
DS$BRANCH           000100A8              DS$_DEVNAME      = 00660108              L_COUNT            00000004 R      02
DS$BREAK            00010058              DS$_ERROR        = 00660002              L_IS_SP            00000014 R      02
DS$CANWAIT          00010070              DS$_FHWE         = 00660068              L_KS_SP            00000018 R      02
DS$CHANNEL          00010180              DS$_FRAGBUF      = 00660080              L_PSL              00000010 R      02
DS$CKLOOP           00010040              DS$_ICBUSY       = 006600C8              MANUAL           = 00000001  G
DS$CLRVEC           00010168              DS$_ICERR        = 006600C0              MCHK             = 00000005  G
DS$CNTRLC           00010078              DS$_IHWE         = 00660060              MEM              = 00000009  G
DS$CVTREG           000100B0              DS$_ILLCHAR      = 00660018              MSG_002            00000002 R      04
DS$ENDPASS          00010010              DS$_ILLPAGCNT    = 00660078              M_BADMODE_DN     = 00000001
DS$ENDSUB           00010038              DS$_ILLUNIT      = 00660100              M_BADMODE_UP     = 00000002
DS$ERRDEV           000100C8              DS$_INSFMEM      = 00660050              M_BADSTACK_DN    = 00000004
DS$ERRHARD          000100D0              DS$_IPL2HI       = 006600B8              M_BADSTACK_UP    = 00000008
DS$ERRPREP          00010108              DS$_IVADDR       = 00660040              M_BAD_PC         = 00000004
DS$ERRSOFT          000100D8              DS$_IVVECT       = 00660038              M_PWRDN_DONE     = 00000001
DS$ERRSYS           000100C0              DS$_KRNLSTK      = 00660090              M_PWRUP_DONE     = 00000002
DS$ESCAPE           00010050              DS$_LOGIC        = 00660070              M_PWRUP_ERR      = 00000010
DS$FREEDBGSYM       000101B8              DS$_MCHK         = 00660088              PAR$M_ATDEF      = 00000010
DS$GETBUF           00010120              DS$_MMOFF        = 00660058              PAR$M_ATHI       = 00000008
DS$GETMEM           00010130              DS$_NEEDUNIT     = 006600F8              PAR$M_ATLO       = 00000004
DS$GPHARD           00010018              DS$_NOPCS        = 00660110              PAR$M_NODEF      = 00000002
DS$HELP             000101B0              DS$_NORMAL       = 00660001              PAR$V_ATDEF      = 00000004
DS$INITSCB          00010170              DS$_NOSUPPORT    = 006600B1              PAR$V_ATHI       = 00000003
DS$INLOOP           00010048              DS$_NOTDON       = 00660030              PAR$V_ATLO       = 00000002
DS$K_ERROR        = 00000002              DS$_NOTIMP       = 006600B0              PAR$V_NODEF      = 00000001
```

```
PAR$_BIN        = 00000002              PSL$S_IPL       = 00000005              SEP_FUNCTIONAL  = 00000002
PAR$_DEC        = 0000000A              PSL$S_PRVMOD    = 00000002              SEP_REPAIR      = 00000003
PAR$_HEX        = 00000010              PSL$V_C         = 00000000              SIZ...          = 00000001
PAR$_NO         = 00000000              PSL$V_CBIT      = 00000000              STRTUP          = 00000100
PAR$_OCT        = 00000008              PSL$V_CM        = 0000001F              SYS$ALLOC         00010238
PAR$_YES        = 00000001              PSL$V_CURMOD    = 00000018              SYS$ASCTIM        00010248
POWER           = 00000003  G           PSL$V_DV        = 00000007              SYS$ASSIGN        00010250
POWER_DOWN        000003EC R      02    PSL$V_FPD       = 0000001B              SYS$BINTIM        00010258
POWER_DOWN_1      000000BF R      04    PSL$V_FU        = 00000006              SYS$CANCEL        00010260
POWER_DOWN_2      00000154 R      04    PSL$V_IPL       = 00000010              SYS$CANTIM        00010268
POWER_DOWN_3      00000202 R      04    PSL$V_IS        = 0000001A              SYS$CLOSE         000105B8
POWER_UP          000004A0 R      02    PSL$V_IV        = 00000005              SYS$CLREF         00010298
POWER_UP_ERR      0000049B R      02    PSL$V_N         = 00000003              SYS$CONNECT       000105C0
PR$_ASTLVL        ********   X    02    PSL$V_NBIT      = 00000003              SYS$DALLOC        000102D8
PR$_ESP           ********   X    02    PSL$V_PRVMOD    = 00000016              SYS$DASSGN        000102E0
PR$_ISP           ********   X    02    PSL$V_TBIT      = 00000004              SYS$DISCONNECT    000105D0
PR$_KSP           ********   X    02    PSL$V_TP        = 0000001E              SYS$FAO           00010350
PR$_P0BR          ********   X    02    PSL$V_V         = 00000001              SYS$FAOL          00010358
PR$_P0LR          ********   X    02    PSL$V_VBIT      = 00000001              SYS$GET           00010580
PR$_P1BR          ********   X    02    PSL$V_Z         = 00000002              SYS$GETCHN        000104C8
PR$_P1LR          ********   X    02    PSL$V_ZBIT      = 00000002              SYS$GETTIM        00010378
PR$_PCBB          ********   X    02    SCB$L_ACCESS      00000020              SYS$LKWSET        000103A0
PR$_SBR           ********   X    02    SCB$L_ARITH       00000034              SYS$NUMTIM        000103B8
PR$_SCBB          ********   X    02    SCB$L_BREAK       0000002C              SYS$OPEN          00010608
PR$_SLR           ********   X    02    SCB$L_CHME        00000044              SYS$QIO           000103C8
PR$_SSP           ********   X    02    SCB$L_CHMK        00000040              SYS$QIOW          00010200
PR$_TXDB          ********   X    02    SCB$L_CHMS        00000048              SYS$READ          00010590
PR$_USP           ********   X    02    SCB$L_CHMU        0000004C              SYS$READEF        000103D0
PSL$C_EXEC      = 00000001              SCB$L_COMPAT      00000030              SYS$SETAST        000103F8
PSL$C_KERNEL    = 00000000              SCB$L_KNLSTK      00000008              SYS$SETEF         00010400
PSL$C_SUPER     = 00000002              SCB$L_MACHCHK     00000004              SYS$SETIMR        00010420
PSL$C_USER      = 00000003              SCB$L_OPCCUS      00000014              SYS$SETPRI        00010428
PSL$K_EXEC      = 00000001              SCB$L_OPCDEC      00000010              SYS$SETPRT        00010430
PSL$K_KERNEL    = 00000000              SCB$L_POWER       0000000C              SYS$SETRWM        00010438
PSL$K_SUPER     = 00000002              SCB$L_RADRMOD     0000001C              SYS$SETSWM        00010448
PSL$K_USER      = 00000003              SCB$L_ROPRAND     00000018              SYS$ULKPAG        00010460
PSL$M_C         = 00000001              SCB$L_RXDB        000000F8              SYS$ULWSET        00010468
PSL$M_CBIT      = 00000001              SCB$L_SFTLVL1     00000084              SYS$UNWIND        00010470
PSL$M_CM        = 80000000              SCB$L_SFTLVL10    000000A8              SYS$WAITFR        00010478
PSL$M_CURMOD    = 03000000              SCB$L_SFTLVL11    000000AC              SYS$WFLAND        00010488
PSL$M_DV        = 00000080              SCB$L_SFTLVL12    000000B0              SYS$WFLOR         00010490
PSL$M_FPD       = 08000000              SCB$L_SFTLVL13    000000B4              T2_S1             0000007F RG     04
PSL$M_FU        = 00000040              SCB$L_SFTLVL14    000000B8              T2_S1_X           000000F6 R      04
PSL$M_IPL       = 001F0000              SCB$L_SFTLVL15    000000BC              T2_S2             00000101 RG     04
PSL$M_IS        = 04000000              SCB$L_SFTLVL2     00000088              T2_S2_X           0000018B R      04
PSL$M_IV        = 00000020              SCB$L_SFTLVL3     0000008C              T2_S3             00000196 RG     04
PSL$M_N         = 00000008              SCB$L_SFTLVL4     00000090              T2_S3_X           0000025F R      04
PSL$M_NBIT      = 00000008              SCB$L_SFTLVL5     00000094              TEST_002          00000014 RG     04
PSL$M_PRVMOD    = 00C00000              SCB$L_SFTLVL6     00000098              TEST_002_X        00000276 RG     04
PSL$M_SAFBITS   = 000037FF              SCB$L_SFTLVL7     0000009C              TU58            = 00000002  G
PSL$M_TBIT      = 00000010              SCB$L_SFTLVL8     000000A0              T_BADMODE         000002BB R      02
PSL$M_TP        = 40000000              SCB$L_SFTLVL9     000000A4              T_BADMODE_DN      000002E3 R      02
PSL$M_V         = 00000002              SCB$L_TBIT        00000028              T_BADMODE_UP      0000030D R      02
PSL$M_VBIT      = 00000002              SCB$L_TIMER       000000C0              T_BADSTACK        00000335 R      02
PSL$M_Z         = 00000004              SCB$L_TRANSL      00000024              T_BADSTACK_DN     00000364 R      02
PSL$M_ZBIT      = 00000004              SCB$L_TXDB        000000FC              T_BADSTACK_UP     00000395 R      02
PSL$S_CURMOD    = 00000002              SCB$L_ZERO        00000000              T_CHECKSUM_ERR    000003C4 R      02
```

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T_INST              0000005A R     02
T_MESSAGE_1         00000093 R     02
T_MESSAGE_2         0000013E R     02
T_MESSAGE_3         000001D9 R     02
T_NO_KA730          00000025 R     02
T_PWRDN_ERROR       00000273 R     02
T_PWRUP_ERROR       00000298 R     02
UBI               = 0000000A   G
V_BADMODE_DN      = 00000000
V_BADMODE_UP      = 00000001
V_BADSTACK_DN     = 00000002
V_BADSTACK_UP     = 00000003
V_BAD_PC          = 00000002
V_PWRDN_DONE      = 00000000
V_PWRUP_DONE      = 00000001
V_PWRUP_ERR       = 00000004
WCS               = 00000007   G


                                                 +----------------+
                                                 ! Psect synopsis !
                                                 +----------------+

PSECT name                        Allocation           PSECT No.  Attributes
----------                        ----------           ---------  ----------
.  ABS  .                         00000000  (     0.)  00 (  0.)  NOPIC   USR   CON   ABS   LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
. BLANK .                         00000000  (     0.)  01 (  1.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD     WRT NOVEC BYTE
ENKAXC                            0000064F  ( 1615.)  02 (  2.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
$ABS$                             00010610  (67088.)  03 (  3.)  NOPIC   USR   CON   ABS   LCL NOSHR   EXE   RD     WRT NOVEC BYTE
TEST_002                          0000027E  (  638.)  04 (  4.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
DISPATCH                          00000018  (    24.)  05 (  5.)  NOPIC   USR   CON   REL   LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
ARGLIST                           00000024  (    36.)  06 (  6.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC LONG
$TSTCNT                           00000004  (     4.)  07 (  7.)  NOPIC   USR   OVR   REL   LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
```

```
                                             +------------------------+
                                             ! Symbol Cross Reference !
                                             +------------------------+
SYMBOL          VALUE        DEFINITION      REFERENCES...
------          -----        ----------      -------------
$$$            =00000018-R   512    (9)      390    (7)      451    (8)      512    (9)
$$E            =00000001     512    (9)      410    (7)      475    (8)      542    (9)
$$M            =00000004     539    (9)      269    (5)      272    (5)      274    (5)      278    (5)      281    (5)
                                             283    (5)      340    (6)      407    (7)      472    (8)      536    (9)
                                             539    (9)
$$N            =00000000     539    (9)      269    (5)      272    (5)      274    (5)      278    (5)      281    (5)
                                             283    (5)    #-344    (6)    #-355    (6)    #-399    (7)      407    (7)
                                           #-464    (8)      472    (8)    #-528    (9)      536    (9)      539    (9)
                                             80     (3)
$$S            =FFFFFFFF     546    (9)      318    (6)      340    (6)      358    (7)      390    (7)      414    (8)
                                             451    (8)      479    (9)      512    (9)
$ENV           =00000001     62     (3)
$ER            =FFFFFFFF     546    (9)    #-269    (5)    #-272    (5)    #-274    (5)    #-278    (5)    #-281    (5)
                                           #-283    (5)      390    (7)    #-407    (7)      451    (8)    #-472    (8)
                                             512    (9)    #-536    (9)    #-539    (9)
$MO            =00000001     548    (9)      548    (9)
$S$            =00000018-R   512    (9)      390    (7)      410    (7)      451    (8)      475    (8)      512    (9)
                                             542    (9)
$ST            =00000000     546    (9)      269    (5)      272    (5)      274    (5)      278    (5)      281    (5)
                                             283    (5)      340    (6)      358    (7)      390    (7)      407    (7)
                                             410    (7)      414    (8)      451    (8)      472    (8)      475    (8)
                                             479    (9)      512    (9)      536    (9)      539    (9)      542    (9)
                                             546    (9)
$TN            =00000002     548    (9)      269    (5)      272    (5)      274    (5)      278    (5)      281    (5)
                                             283    (5)      318    (6)      340    (6)      345    (6)      358    (7)
                                             407    (7)      414    (8)      472    (8)      479    (9)      536    (9)
                                             539    (9)      546    (9)      548    (9)
ALL            =00000008     80     (3)      340    (6)
A_BUFFER_BEGIN  00000000-XR                  309    (5)      459    (8)      460    (8)      522    (9)      523    (9)
A_PWR_BUFFER    00000000-XR                  195    (5)
BASE_002        00000000-R   318    (6)      340    (6)
BIT...         =00000005     78     (3)      62     (3)      75     (3)      77     (3)      78     (3)
B_FLAGS         0000001D-R   96     (3)    #-223    (5)    #-285    (5)    #-392    (7)      403    (7)      406    (7)
                                           #-453    (8)      468    (8)      471    (8)    #-514    (9)      532    (9)
                                             538    (9)
B_FLAGS2        0000001E-R   97     (3)    #-200    (5)    #-202    (5)    #-236    (5)    #-244    (5)    #-246    (5)
                                             267    (5)      268    (5)      271    (5)      276    (5)      277    (5)
                                             280    (5)    #-393    (7)    #-454    (8)    #-515    (9)      535    (9)
B_RESPONSE      0000001C-R   95     (3)
CALC_CHECKSUM   00000620-R   297    (5)      350    (6)      353    (6)
CEP_FUNCTIONAL =00000000     62     (3)
CEP_REPAIR     =00000001     62     (3)      62     (3)
CLEAR_BUFFER    00000637-R   308    (5)      391    (7)      452    (8)      513    (9)
DATA_002        00000010-R   340    (6)      340    (6)
DEFAULT        =00000000     80     (3)
DS$ABORT        00010020     76     (3)      270    (5)      273    (5)      275    (5)      279    (5)      282    (5)
                                             284    (5)      408    (7)      473    (8)      537    (9)      540    (9)
DS$ASKADR       00010090     76     (3)
DS$ASKDATA      00010080     76     (3)
DS$ASKLGCL      00010098     76     (3)
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DS$ASKSTR       000100A0    76     (3)
DS$ASKVLD       00010088    76     (3)
DS$ATTACH       000101A8    76     (3)
DS$BGNSUB       00010030    76     (3)     390    (7)      451    (8)      512    (9)
DS$BRANCH       000100A8    76     (3)
DS$BREAK        00010058    76     (3)     224    (5)      402    (7)      467    (8)      531    (9)      546    (9)
DS$CANWAIT      00010070    76     (3)
DS$CHANNEL      00010180    76     (3)
DS$CKLOOP       00010040    76     (3)
DS$CLRVEC       00010168    76     (3)     544    (9)
DS$CNTRLC       00010078    76     (3)
DS$CVTREG       000100B0    76     (3)
DS$ENDPASS      00010010    76     (3)
DS$ENDSUB       00010038    76     (3)     410    (7)      475    (8)      542    (9)
DS$ERRDEV       000100C8    76     (3)
DS$ERRHARD      000100D0    76     (3)     269    (5)      272    (5)      274    (5)      278    (5)      281    (5)
                                           283    (5)      407    (7)      472    (8)      536    (9)      539    (9)
DS$ERRPREP      00010108    76     (3)
DS$ERRSOFT      000100D8    76     (3)
DS$ERRSYS       000100C0    76     (3)
DS$ESCAPE       00010050    76     (3)
DS$FREEDBGSYM   000101B8    76     (3)
DS$GETBUF       00010120    76     (3)
DS$GETMEM       00010130    76     (3)
DS$GPHARD       00010018    76     (3)
DS$HELP         000101B0    76     (3)
DS$INITSCB      00010170    76     (3)
DS$INLOOP       00010048    76     (3)
DS$K_ERROR     =00000002    75     (3)
DS$K_NORMAL    =00000001    75     (3)
DS$K_SEVERE    =00000004    75     (3)
DS$K_SUBSYS    =00000066    75     (3)     75     (3)
DS$K_WARNING   =00000000    75     (3)
DS$LOAD         00010198    76     (3)
DS$LOADPCS      000101C0    76     (3)
DS$MAPDBGBLOCK  00010118    76     (3)
DS$MMOFF        00010158    76     (3)
DS$MMON         00010150    76     (3)
DS$MOVPHY       00010148    76     (3)
DS$MOVVRT       00010140    76     (3)
DS$PARSE        000100B8    76     (3)
DS$PRINTB       000100E0    76     (3)
DS$PRINTF       000100F0    76     (3)     344    (6)      355    (6)      399    (7)      464    (8)      528    (9)
DS$PRINTS       000100F8    76     (3)
DS$PRINTSIG     00010100    76     (3)
DS$PRINTX       000100E8    76     (3)
DS$PROBE        000101A0    76     (3)
DS$RELBUF       00010128    76     (3)
DS$RELMEM       00010138    76     (3)
DS$SETIPL       00010178    76     (3)
DS$SETMAP       00010188    76     (3)
DS$SETPRIEXV    00010110    76     (3)
DS$SETVEC       00010160    76     (3)     347    (6)
DS$SHOCHAN      00010190    76     (3)
DS$SUMMARY      00010028    76     (3)
DS$WAITMS       00010060    76     (3)
DS$WAITUS       00010068    76     (3)
```

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DS$_ARITH       =006600D0      75       (3)
DS$_BADLINK     =006600F0      75       (3)
DS$_BADTYPE     =006600E8      75       (3)
DS$_CHME        =006600A8      75       (3)
DS$_CHMK        =006600E0      75       (3)
DS$_DEVNAME     =00660108      75       (3)
DS$_ERROR       =00660002      75       (3)
DS$_FHWE        =00660068      75       (3)
DS$_FRAGBUF     =00660080      75       (3)
DS$_ICBUSY      =006600C8      75       (3)
DS$_ICERR       =006600C0      75       (3)
DS$_IHWE        =00660060      75       (3)
DS$_ILLCHAR     =00660018      75       (3)
DS$_ILLPAGCNT   =00660078      75       (3)
DS$_ILLUNIT     =00660100      75       (3)
DS$_INSFMEM     =00660050      75       (3)
DS$_IPL2HI      =006600B8      75       (3)
DS$_IVADDR      =00660040      75       (3)
DS$_IVVECT      =00660038      75       (3)
DS$_KRNLSTK     =00660090      75       (3)
DS$_LOGIC       =00660070      75       (3)
DS$_MCHK        =00660088      75       (3)
DS$_MMOFF       =00660058      75       (3)
DS$_NEEDUNIT    =006600F8      75       (3)
DS$_NOPCS       =00660110      75       (3)
DS$_NORMAL      =00660001      75       (3)
DS$_NOSUPPORT   =006600B1      75       (3)
DS$_NOTDON      =00660030      75       (3)
DS$_NOTIMP      =006600B0      75       (3)       75       (3)
DS$_NULLSTR     =00660010      75       (3)
DS$_OVERFLOW    =00660008      75       (3)
DS$_POWER       =00660098      75       (3)
DS$_PROGERR     =00660020      75       (3)
DS$_SEVERE      =00660004      75       (3)
DS$_TRANSL      =006600A0      75       (3)
DS$_TRUNCATE    =00660028      75       (3)
DS$_UNEXPINT    =006600D8      75       (3)
DS$_VASFULL     =00660048      75       (3)
DS$_WARNING     =00660000      75       (3)       75       (3)
ENV$M_DOMAIN    =00000002      62       (3)
ENV$M_LEVEL     =00000001      62       (3)
ENV$M_SUPER     =000003FC      62       (3)
ENV$S_DOMAIN    =00000001      62       (3)
ENV$S_LEVEL     =00000001      62       (3)
ENV$S_SUPER     =00000008      62       (3)
ENV$V_DOMAIN    =00000001      62       (3)       62       (3)
ENV$V_LEVEL     =00000000      62       (3)       62       (3)
ENV$V_SUPER     =00000002      62       (3)
ENV$_CPU        =00000000      62       (3)       62       (3)
ENV$_FUNCTIONAL=00000000       62       (3)       62       (3)
ENV$_REPAIR     =00000001      62       (3)       62       (3)
ENV$_SUPER      =00000001      62       (3)
ENV$_SYSTEM     =00000001      62       (3)       62       (3)
HALT            =00000004      80       (3)
IPR             =00000006      80       (3)
JUMP             0000001F-R    118      (3)     #-527      (9)
KA_PTABLE        00000000-XR                    #-342      (6)
```

```
KA_UNIT_NO      00000000-XR                #-269    (5)    #-272    (5)    #-274    (5)    #-278    (5)    #-281    (5)
                                           #-283    (5)    #-407    (7)    #-472    (8)    #-536    (9)    #-539    (9)
LDPCTX         =0000000B     80     (3)
L_BUF_BEGIN     00000000-R   87     (3)    #-222    (5)    #-238    (5)
L_CHECKSUM      00000008-R   89     (3)    #-351    (6)    #-397    (7)    #-462    (8)    #-525    (9)
L_CHECKSUM1     0000000C-R   90     (3)    #-354    (6)    #-519    (9)
L_COUNT         00000004-R   88     (3)    #-299    (5)    #-302    (5)    #-310    (5)    #-312    (5)
L_IS_SP         00000014-R   92     (3)    #-203    (5)    #-206    (5)    #-247    (5)    #-250    (5)    #-251    (5)
L_KS_SP         00000018-R   93     (3)    #-204    (5)    #-207    (5)    #-248    (5)    #-252    (5)
L_PSL           00000010-R   91     (3)    #-196    (5)      198    (5)      201    (5)    #-240    (5)      242    (5)
                                             245    (5)
MANUAL         =00000001     80     (3)      340    (6)
MCHK           =00000005     80     (3)
MEM            =00000009     80     (3)
MSG_002         00000002-R   318    (6)      340    (6)
M_BADMODE_DN   =00000001     107    (3)    #-200    (5)
M_BADMODE_UP   =00000002     109    (3)    #-244    (5)
M_BADSTACK_DN  =00000004     111    (3)    #-202    (5)
M_BADSTACK_UP  =00000008     113    (3)    #-246    (5)
M_BAD_PC       =00000004     104    (3)
M_PWRDN_DONE   =00000001     100    (3)    #-223    (5)
M_PWRUP_DONE   =00000002     102    (3)    #-285    (5)
M_PWRUP_ERR    =00000010     115    (3)    #-236    (5)
PAR$M_ATDEF    =00000010     78     (3)
PAR$M_ATHI     =00000008     78     (3)
PAR$M_ATLO     =00000004     78     (3)
PAR$M_NODEF    =00000002     78     (3)
PAR$V_ATDEF    =00000004     78     (3)
PAR$V_ATHI     =00000003     78     (3)
PAR$V_ATLO     =00000002     78     (3)
PAR$V_NODEF    =00000001     78     (3)
PAR$_BIN       =00000002     78     (3)
PAR$_DEC       =0000000A     78     (3)
PAR$_HEX       =00000010     78     (3)
PAR$_NO        =00000000     78     (3)
PAR$_OCT       =00000008     78     (3)
PAR$_YES       =00000001     78     (3)
POWER          =00000003     80     (3)      340    (6)
POWER_DOWN      000003EC-R   194    (5)      347    (6)
POWER_DOWN_1    000000BF-R   401    (7)    #-404    (7)
POWER_DOWN_2    00000154-R   466    (8)    #-469    (8)
POWER_DOWN_3    00000202-R   530    (9)    #-533    (9)
POWER_UP        000004A0-R   237    (5)      118    (3)      349    (6)      396    (7)      461    (8)      524    (9)
POWER_UP_ERR    0000049B-R   235    (5)      352    (6)      518    (9)
PR$_ASTLVL      00000000-XR                #-220    (5)    #-253    (5)
PR$_ESP         00000000-XR                #-210    (5)    #-263    (5)
PR$_ISP         00000000-XR                #-203    (5)    #-247    (5)    #-250    (5)
PR$_KSP         00000000-XR                #-207    (5)    #-252    (5)
PR$_P0BR        00000000-XR                #-216    (5)    #-257    (5)
PR$_P0LR        00000000-XR                #-217    (5)    #-256    (5)
PR$_P1BR        00000000-XR                #-218    (5)    #-255    (5)
PR$_P1LR        00000000-XR                #-219    (5)    #-254    (5)
PR$_PCBB        00000000-XR                #-215    (5)    #-258    (5)
PR$_SBR         00000000-XR                #-213    (5)    #-260    (5)
PR$_SCBB        00000000-XR                #-221    (5)    #-239    (5)
PR$_SLR         00000000-XR                #-214    (5)    #-259    (5)
PR$_SSP         00000000-XR                #-211    (5)    #-262    (5)
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PR$_TXDB        00000000-XR                #-286    (5)    #-348    (6)
PR$_USP         00000000-XR                #-212    (5)    #-261    (5)
PSL$C_EXEC     =00000001     77     (3)
PSL$C_KERNEL   =00000000     77     (3)
PSL$C_SUPER    =00000002     77     (3)
PSL$C_USER     =00000003     77     (3)
PSL$K_EXEC     =00000001     77     (3)
PSL$K_KERNEL   =00000000     77     (3)    #-198    (5)    #-242    (5)
PSL$K_SUPER    =00000002     77     (3)
PSL$K_USER     =00000003     77     (3)
PSL$M_C        =00000001     77     (3)
PSL$M_CBIT     =00000001     77     (3)
PSL$M_CM       =80000000     77     (3)      77     (3)
PSL$M_CURMOD   =03000000     77     (3)
PSL$M_DV       =00000080     77     (3)
PSL$M_FPD      =08000000     77     (3)      77     (3)
PSL$M_FU       =00000040     77     (3)
PSL$M_IPL      =001F0000     77     (3)
PSL$M_IS       =04000000     77     (3)
PSL$M_IV       =00000020     77     (3)
PSL$M_N        =00000008     77     (3)
PSL$M_NBIT     =00000008     77     (3)
PSL$M_PRVMOD   =00C00000     77     (3)
PSL$M_SAFBITS  =000037FF     77     (3)
PSL$M_TBIT     =00000010     77     (3)
PSL$M_TP       =40000000     77     (3)      77     (3)
PSL$M_V        =00000002     77     (3)
PSL$M_VBIT     =00000002     77     (3)
PSL$M_Z        =00000004     77     (3)
PSL$M_ZBIT     =00000004     77     (3)
PSL$S_CURMOD   =00000002     77     (3)    #-197    (5)    #-241    (5)
PSL$S_IPL      =00000005     77     (3)
PSL$S_PRVMOD   =00000002     77     (3)
PSL$V_C        =00000000     77     (3)
PSL$V_CBIT     =00000000     77     (3)
PSL$V_CM       =0000001F     77     (3)
PSL$V_CURMOD   =00000018     77     (3)    #-197    (5)    #-241    (5)
PSL$V_DV       =00000007     77     (3)
PSL$V_FPD      =0000001B     77     (3)
PSL$V_FU       =00000006     77     (3)
PSL$V_IPL      =00000010     77     (3)
PSL$V_IS       =0000001A     77     (3)    #-201    (5)    #-245    (5)
PSL$V_IV       =00000005     77     (3)
PSL$V_N        =00000003     77     (3)
PSL$V_NBIT     =00000003     77     (3)
PSL$V_PRVMOD   =00000016     77     (3)
PSL$V_TBIT     =00000004     77     (3)
PSL$V_TP       =0000001E     77     (3)
PSL$V_V        =00000001     77     (3)
PSL$V_VBIT     =00000001     77     (3)
PSL$V_Z        =00000002     77     (3)
PSL$V_ZBIT     =00000002     77     (3)
SCB$L_ACCESS    00000020     74     (3)
SCB$L_ARITH     00000034     74     (3)
SCB$L_BREAK     0000002C     74     (3)
SCB$L_CHME      00000044     74     (3)
SCB$L_CHMK      00000040     74     (3)
```

```
SCB$L_CHMS       00000048      74      (3)
SCB$L_CHMU       0000004C      74      (3)
SCB$L_COMPAT     00000030      74      (3)
SCB$L_KNLSTK     00000008      74      (3)
SCB$L_MACHCHK    00000004      74      (3)
SCB$L_OPCCUS     00000014      74      (3)
SCB$L_OPCDEC     00000010      74      (3)
SCB$L_POWER      0000000C      74      (3)     #-347    (6)     #-544    (9)
SCB$L_RADRMOD    0000001C      74      (3)
SCB$L_ROPRAND    00000018      74      (3)
SCB$L_RXDB       000000F8      74      (3)
SCB$L_SFTLVL1    00000084      74      (3)
SCB$L_SFTLVL10   000000A8      74      (3)
SCB$L_SFTLVL11   000000AC      74      (3)
SCB$L_SFTLVL12   000000B0      74      (3)
SCB$L_SFTLVL13   000000B4      74      (3)
SCB$L_SFTLVL14   000000B8      74      (3)
SCB$L_SFTLVL15   000000BC      74      (3)
SCB$L_SFTLVL2    00000088      74      (3)
SCB$L_SFTLVL3    0000008C      74      (3)
SCB$L_SFTLVL4    00000090      74      (3)
SCB$L_SFTLVL5    00000094      74      (3)
SCB$L_SFTLVL6    00000098      74      (3)
SCB$L_SFTLVL7    0000009C      74      (3)
SCB$L_SFTLVL8    000000A0      74      (3)
SCB$L_SFTLVL9    000000A4      74      (3)
SCB$L_TBIT       00000028      74      (3)
SCB$L_TIMER      000000C0      74      (3)
SCB$L_TRANSL     00000024      74      (3)
SCB$L_TXDB       000000FC      74      (3)
SCB$L_ZERO       00000000      74      (3)
SEP_FUNCTIONAL  =00000002      62      (3)
SEP_REPAIR      =00000003      62      (3)
SIZ...          =00000001      78      (3)       62     (3)       77     (3)       78     (3)
STRTUP          =00000100      120     (3)     #-527    (9)
SYS$ALLOC        00010238      76      (3)
SYS$ASCTIM       00010248      76      (3)
SYS$ASSIGN       00010250      76      (3)
SYS$BINTIM       00010258      76      (3)
SYS$CANCEL       00010260      76      (3)
SYS$CANTIM       00010268      76      (3)
SYS$CLOSE        000105B8      76      (3)
SYS$CLREF        00010298      76      (3)
SYS$CONNECT      000105C0      76      (3)
SYS$DALLOC       000102D8      76      (3)
SYS$DASSGN       000102E0      76      (3)
SYS$DISCONNECT   000105D0      76      (3)
SYS$FAO          00010350      76      (3)
SYS$FAOL         00010358      76      (3)
SYS$GET          00010580      76      (3)
SYS$GETCHN       000104C8      76      (3)
SYS$GETTIM       00010378      76      (3)
SYS$LKWSET       000103A0      76      (3)
SYS$NUMTIM       000103B8      76      (3)
SYS$OPEN         00010608      76      (3)
SYS$QIO          000103C8      76      (3)
SYS$QIOW         00010200      76      (3)
```

```
SYS$READ          00010590      76     (3)
SYS$READEF        000103D0      76     (3)
SYS$SETAST        000103F8      76     (3)
SYS$SETEF         00010400      76     (3)
SYS$SETIMR        00010420      76     (3)
SYS$SETPRI        00010428      76     (3)
SYS$SETPRT        00010430      76     (3)
SYS$SETRWM        00010438      76     (3)
SYS$SETSWM        00010448      76     (3)
SYS$ULKPAG        00010460      76     (3)
SYS$ULWSET        00010468      76     (3)
SYS$UNWIND        00010470      76     (3)
SYS$WAITFR        00010478      76     (3)
SYS$WFLAND        00010488      76     (3)
SYS$WFLOR         00010490      76     (3)
T2_S1             0000007F-R    390    (7)
T2_S1_X           000000F6-R    410    (7)
T2_S2             00000101-R    451    (8)
T2_S2_X           0000018B-R    475    (8)
T2_S3             00000196-R    512    (9)
T2_S3_X           0000025F-R    542    (9)
TEST_002          00000014-R    340    (6)        340    (6)
TEST_002_X        00000276-R    546    (9)      #-345    (6)
TU58             =00000002      80     (3)
T_BADMODE         000002BB-R    156    (4)        272    (5)
T_BADMODE_DN      000002E3-R    160    (4)        274    (5)
T_BADMODE_UP      0000030D-R    164    (4)        269    (5)
T_BADSTACK        00000335-R    168    (4)        281    (5)
T_BADSTACK_DN     00000364-R    172    (4)        283    (5)
T_BADSTACK_UP     00000395-R    176    (4)        278    (5)
T_CHECKSUM_ERR    000003C4-R    180    (4)        536    (9)
T_INST            0000005A-R    127    (4)        355    (6)
T_MESSAGE_1       00000093-R    130    (4)        399    (7)
T_MESSAGE_2       0000013E-R    135    (4)        528    (9)
T_MESSAGE_3       000001D9-R    140    (4)        464    (8)
T_NO_KA730        00000025-R    124    (4)        344    (6)
T_PWRDN_ERROR     00000273-R    148    (4)        407    (7)        472    (8)        539    (9)
T_PWRUP_ERROR     00000298-R    152    (4)
UBI              =0000000A      80     (3)
V_BADMODE_DN     =00000000      106    (3)      #-267    (5)
V_BADMODE_UP     =00000001      108    (3)      #-268    (5)      #-271    (5)
V_BADSTACK_DN    =00000002      110    (3)      #-276    (5)
V_BADSTACK_UP    =00000003      112    (3)      #-277    (5)      #-280    (5)
V_BAD_PC         =00000002      103    (3)
V_PWRDN_DONE     =00000000      99     (3)      #-406    (7)      #-471    (8)      #-538    (9)
V_PWRUP_DONE     =00000001      101    (3)      #-403    (7)      #-468    (8)      #-532    (9)
V_PWRUP_ERR      =00000004      114    (3)      #-535    (9)
WCS              =00000007      80     (3)
```

```
                                                 +-------------------------+
                                                 ! Macros Cross Reference !
                                                 +-------------------------+
MACRO                SIZE            DEFINITION       REFERENCES...
-----                ----            ----------       -------------
$D1_ABPROGRAM        1               270      (5)     270      (5)       273      (5)       275      (5)       279      (5)       282      (5)
                                                      284      (5)       408      (7)       473      (8)       537      (9)       540      (9)
$D1_BSUBT            1               390      (7)     390      (7)       451      (8)       512      (9)
$D1_BTEST            1               340      (6)     340      (6)
$D1_ERR              1               269      (5)     269      (5)       272      (5)       274      (5)       278      (5)       281      (5)
                                                      283      (5)       407      (7)       472      (8)       536      (9)       539      (9)
$D1_ERR_S            1               269      (5)     269      (5)       272      (5)       274      (5)       278      (5)       281      (5)
                                                      283      (5)       407      (7)       472      (8)       536      (9)       539      (9)
$D1_ESUBT            1               410      (7)     410      (7)       475      (8)       542      (9)
$D1_ETEST            1               546      (9)     546      (9)
$D1_EXTEST           1               345      (6)     345      (6)
$D1_PRINT_S          1               344      (6)     344      (6)       355      (6)       399      (7)       464      (8)       528      (9)
$D1_SBTTL            2               318      (6)     318      (6)       358      (7)       414      (8)       479      (9)
$D2_BDATA            1               340      (6)     340      (6)
$D2_BTEST            1               340      (6)     340      (6)
$D2_SBTTL            1               318      (6)     318      (6)
$DEF                 1               78       (3)     74       (3)       76       (3)
$DEFEND              1               74       (3)     74       (3)       76       (3)       77       (3)
$DEFINI              1               74       (3)     74       (3)       76       (3)       77       (3)
$DS_ABORT            1               270      (5)     270      (5)       273      (5)       275      (5)       279      (5)       282      (5)
                                                      284      (5)       408      (7)       473      (8)       537      (9)       540      (9)
$DS_BGNMOD           1               62       (3)     62       (3)
$DS_BGNSUB           1               390      (7)     390      (7)       451      (8)       512      (9)
$DS_BGNTEST          1               340      (6)     340      (6)
$DS_BREAK            1               224      (5)     224      (5)       402      (7)       467      (8)       531      (9)       546      (9)
$DS_CLRVEC_S         1               544      (9)     544      (9)
$DS_DSDEF            2               75       (3)     75       (3)
$DS_DSSDEF           1               76       (3)     76       (3)
$DS_ENDDATA          1               340      (6)     340      (6)
$DS_ENDMOD           1               548      (9)     548      (9)
$DS_ENDSUB           1               410      (7)     410      (7)       475      (8)       542      (9)
$DS_ENDTEST          1               546      (9)     546      (9)
$DS_ENVDEF           2               62       (3)     62       (3)
$DS_ERRHARD_S        1               269      (5)     269      (5)       272      (5)       274      (5)       278      (5)       281      (5)
                                                      283      (5)       407      (7)       472      (8)       536      (9)       539      (9)
$DS_EXIT             1               345      (6)     345      (6)
$DS_PAGE             1               316      (5)     316      (5)       356      (6)       411      (7)       477      (8)
$DS_PARDEF           1               78       (3)     78       (3)
$DS_PRINTF_S         1               344      (6)     344      (6)       355      (6)       399      (7)       464      (8)       528      (9)
$DS_PSLDEF           1               77       (3)     77       (3)
$DS_SBTTL            1               318      (6)     318      (6)       358      (7)       414      (8)       479      (9)
$DS_SCBDEF           1               74       (3)     74       (3)
$DS_SECDEF           1               80       (3)     80       (3)
$DS_SETVEC_S         1               347      (6)     347      (6)
$EQU                 1               78       (3)     62       (3)       75       (3)       77       (3)       78       (3)
$EQULS1              1               77       (3)     62       (3)       75       (3)       77       (3)
$EQULST              1               62       (3)     62       (3)       75       (3)       77       (3)
$GBLINI              2               62       (3)     62       (3)       74       (3)       75       (3)       76       (3)       77       (3)
                                                      78       (3)
$PSLDEF              1               77       (3)     77       (3)
```

```
$PUSHADR            1          269     (5)         269     (5)         272     (5)         274     (5)         278     (5)         281     (5)
                                                   283     (5)         407     (7)         472     (8)         536     (9)         539     (9)
$VIELD              1          62      (3)         62      (3)         77      (3)         78      (3)
$VIELD1             1          78      (3)         62      (3)         77      (3)         78      (3)
ENKAX_SECDEF        1          80      (3)         80      (3)

                                          +-------------------------+
                                          ! Performance indicators !
                                          +-------------------------+

Phase                      Page faults    CPU Time       Elapsed Time
-----                      -----------    --------       ------------
Initialization                      26    00:00:00.04    00:00:00.26
Command processing                  26    00:00:00.22    00:00:00.51
Pass 1                            1072    00:00:12.53    00:00:27.16
Symbol table sort                    2    00:00:00.51    00:00:01.22
Pass 2                             386    00:00:02.90    00:00:08.40
Symbol table output                 33    00:00:00.22    00:00:00.68
Psect synopsis output                5    00:00:00.04    00:00:00.09
Cross-reference output             177    00:00:01.83    00:00:07.35
Assembler run totals              1731    00:00:18.31    00:00:45.69

The working set limit was 900 pages.
137402 bytes (269 pages) of virtual memory were used to buffer the intermediate code.
There were 20 pages of symbol table space allocated to hold 359 non-local and 24 local symbols.
550 source lines were read in Pass 1, producing 28 object records in Pass 2.
94 pages of virtual memory were used to define 41 macros.

                                         +----------------------------+
                                         ! Macro library statistics !
                                         +----------------------------+

Macro library name                       Macros defined
------------------                       --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                        1
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                     36
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                     7
TOTALS (all libraries)                               44

705 GETS were required to define 44 macros.

There were no errors, warnings or information messages.

/LIS/CRO ENKAXC
```

Table of contents

```
     (1)          3           ENKAXD: PROCESSOR HALT
     (2)         63           DECLARATIONS    .LIST   MEB
     (3)        177           INSTRUCION MESSAGES
     (4)        202           ERROR MESSAGES
     (5)        335           DATA TABLES
     (6)        412           SUBROUTINES
     (7)        556           TEST 3:  PROCESSOR HALTS ARCH. DEFINED
     (8)        602           SUBTEST 3.1:  HALT Inst. in Kernel Mode
     (9)        669           SUBTEST 3.2:  Interrupt Stack invalid
     (10)       820           SUBTEST 3.3:  IS SP points to NXM
     (11)       929           SUBTEST 3.4:  CHMU inst. with PSL<IS>=1
     (12)      1033           SUBTEST 3.5:  CHMS inst. with PSL<IS>=1
     (13)      1140           SUBTEST 3.6:  CHME inst. with PSL<IS>=1
     (14)      1247           SUBTEST 3.7:  CHMK inst. with PSL<IS>=1
     (15)      1357           TEST 4:  PROCESSOR HALTS ARCH. UNDEFINED
     (16)      1403           SUBTEST 4.1:  CHMU inst. with vector ser
     (17)      1489           SUBTEST 4.2:  CHMS inst. with vector ser
     (18)      1575           SUBTEST 4.3:  CHME inst. with vector ser
     (19)      1661           SUBTEST 4.4:  CHMK inst. with vector ser
     (20)      1751           SUBTEST 4.5:  Invalid vector HALT
     (21)      1830           SUBTEST 4.6:  SCBB read error HALT
     (22)      1915           SUBTEST 4.7:  Double machine check HALT
     (23)      1984           SUBTEST 4.8:  Transfer to NXM USER WCS
```

```
0000
0000
0000            .SBTTL  ENKAXD: PROCESSOR HALT
0000            .TITLE  ENKAXD  VAX-11/730 Specific CPU Cluster Exerciser
0000            .IDENT  /1-3/
0000
0000    ;
0000    ; Copyright (C) 1981
0000    ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000    ;
0000    ; This software is furnished  under a license for use only on a single
0000    ; computer  system and  may be  copied only with  the inclusion of the
0000    ; above copyright notice.  This software, or any other copies thereof,
0000    ; may not be provided or  otherwise made available to any other person
0000    ; except for use on such system and to one who agrees to these license
0000    ; terms.  Title to and  ownership of the  software  shall at all times
0000    ; remain in DEC.
0000    ;
0000    ; The information in this software is subject to change without notice
0000    ; and should  not be construed  as a commitment  by Digital  Equipment
0000    ; Corporation.
0000    ;
0000    ; Dec assumes  no  responsibility  for  the use or  reliability of its
0000    ; software on equipment which is not supplied by DEC.
0000    ;
0000
0000    ;++
0000    ; Facility:       VAX Architecture Diagnostic.
0000    ;
0000    ; Abstract:       This module consists of two tests that check the various ways
0000    ;                 the VAX-11/730 processor can be halted in an ARCHITECTURALLY
0000    ;                 DEFINED and an ARCHITECTURALLY UNDEFINED manner. These ways
0000    ;                 include executing a HALT instruction in kernel mode, attempting
0000    ;                 certain references to an invalid interrupt stack, executing
0000    ;                 a change mode instruction while on the interrupt stack,
0000    ;                 executing a change mode instruction which will be serviced on
0000    ;                 the interrupt stack, SCBB read error, invalid vector, and
0000    ;                 double machine check halts.
0000    ;
0000    ;
0000    ; Environment:    VAX Diagnostic Supervisor.
0000    ;
0000    ; Author:         Rich Lewis      7-Jly-81          Version 1.0
0000    ;
0000    ;                 Tai-Chun Pan    01-Apr-83         Version 1.2
0000    ;
0000    ;                 Added quick flag on Test 7(TU58). If quick flag is set
0000    ;                 will skip subtest 4 through subtest 11.  Added event flag 3.
0000    ;                 If event flag 3 is set, will override protection,
0000    ;                 i.e., go ahead and write on tape.  If run APT & event flag 3
0000    ;                 is clear & tape is not scratch, will report an error.
0000    ;                 Modified Unibus sizer on Test 8 & 9. make test run faster.
0000    ;
0000    ;
0000    ;
0000    ;                 Tai-Chun Pan    03-Aug-83         Version 1.3
0000    ;
```

```
0000      ;                         fixed bugs on TEST 7 and error summary routine call when
0000      ;                         running under APT.
0000      ;
0000      ;--
```

```
                         0000    63            .SBTTL  DECLARATIONS      .LIST    MEB
                         0000    64            .NLIST  CND
                     00000000    65            .PSECT ENKAXD,   LONG
                         0000    66            .LIBRARY          "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                         0000    67            $DS_BGNMOD        CEP_REPAIR, TN=3
                         0000       :::        Macro-32 Diagnostic macro library Version 6.10 'DIAG.MLB (137)'
                         0000    68
                         0000    69 ;
                         0000    70 ; Include files:
                         0000    71 ;
                         0000    72
                         0000    73            .LIBRARY          "ENKAX"            ; CPU Cluster Exerciser library.
                         0000    74
                         0000    75 ;
                         0000    76 ; Equated symbols:
                         0000    77 ;
                         0000    81
                         0000    82            $DS_SCBDEF
                         0000    83            $DS_DSDEF
                         0000    84            $DS_ERRDEF
                         0000    85            $DS_DSSDEF
                         0000    86            $DS_PSLDEF
                         0000    87            $DS_DSADEF
                         0000    88            $DS_PARDEF
                         0000    89
                         0000    90            ENKAX_SECDEF
                         0000    91
                         0000    92
                         0000    93
                         0000    94
           00000004      0000    95 B_ANSWER:          .BLKL                   ; used to store answer (for asklgcl)
           00000008      0004    96 RENTRY_POINT:      .BLKL                   ; used to store rentry address
           0000000C      0008    97 L_PAGESTRT:        .BLKL                   ; first of 2 longword array to store
           00000010      000C    98 L_PAGEND:          .BLKL                   ; page boundary addresses to setprot
           00000014      0010    99 L_PAGEZERO:        .BLKL                   ; first of 2 longword array to store
           00000018      0014   100 L_PAGE0END:        .BLKL                   ; page 0 boundary addresses to setprot
                         0018   101
           0000001C      0018   102 L_COUNT:           .BLKL                   ; used as a counter
           00000020      001C   103 L_ADDRESS:         .BLKL                   ; used to temporary store addresses
           00000024      0020   104 L_CUR_ISP:         .BLKL                   ; used to store initial ISP
           00000028      0024   105 L_EXP_MOD:         .BLKL                   ; temp storage of expected mode
           0000002C      0028   106 L_EXP_STACK:       .BLKL                   ; temp storage of expected stack
           00000030      002C   107 L_OLDPROT:         .BLKL                   ; byte to store old page protection
           00000034      0030   108                    .BLKL
           00000038      0034   109 L_TEMP:            .BLKL                   ; temporary storage
           0000003C      0038   110 L_CUR_SCBB:        .BLKL                   ; location to store SCBB
                         003C   111
           00000040      003C   112 L_FLAGS:           .BLKL                   ; contains the following flags
                         0040   113                                            ; bit positions and masks
           00000000      0040   114 V_READY            =0                      ; ready to execute flag
           00000001      0040   115 M_READY            =1@0                    ;
           00000001      0040   116 V_DONE             =1                      ; restart done flag
           00000002      0040   117 M_DONE             =1@1                    ;
           00000002      0040   118 V_EXECUTE_ERR      =2                      ; execution error flag
           00000004      0040   119 M_EXECUTE_ERR      =1@2                    ;
           00000003      0040   120 V_CHMX_ERR         =3                      ; change mode error
           00000008      0040   121 M_CHMX_ERR         =1@3                    ;
```

```
                          00000004  0040   V_XFC_ERR       =4                      ; XFC error
                          00000010  0040   M_XFC_ERR       =1@4                    ;
                          00000005  0040   V_TIMER         =5                      ; timer interrupt flag
                          00000020  0040   M_TIMER         =1@5                    ;
                          00000006  0040   V_BAD_MODE      =6                      ; bad mode, abort test
                          00000040  0040   M_BAD_MODE      =1@6                    ;
                          00000007  0040   V_BAD_STK       =7                      ; stack bad, abort test
                          00000080  0040   M_BAD_STK       =1@7                    ;
                          00000008  0040   V_FATAL_ERR     =8                      ; flag fatal error
                          00000100  0040   M_FATAL_ERR     =1@8                    ;
                          00000009  0040   V_PSL_ERR       =9                      ; flag PSL error
                          00000200  0040   M_PSL_ERR       =1@9                    ;
                          0000000A  0040   V_GPR_ERR       =10                     ; flag GPR error
                          00000400  0040   M_GPR_ERR       =1@10                   ;
                          0000000B  0040   V_XFC           =11                     ; expected XFC
                          00000800  0040   M_XFC           =1@11                   ;
                          0000000C  0040   V_ERROR_FLAG    =12                     ; flag any error
                          00001000  0040   M_ERROR_FLAG    =1@12                   ;
                          0000000D  0040   V_KSP_ERR       =13                     ; flag KSP error
                          00002000  0040   M_KSP_ERR       =1@13                   ;
                          0000000E  0040   V_ISP_ERR       =14                     ; flag ISP error
                          00004000  0040   M_ISP_ERR       =1@14                   ;
                          0000000F  0040   V_SP_ERR        =15                     ; flag SP error
                          00008000  0040   M_SP_ERR        =1@15                   ;
                          00000010  0040   V_ISTK          =16                     ; flag interrupt stack
                          00010000  0040   M_ISTK          =1@16                   ;
                          00000011  0040   V_MCHK_FLAG     =17                     ; machine check flag
                          00500200  0040   L_NXM_ADR       =^X500200               ; address of non-existent memory
                          00000019  0040   V_USR_WCS       =25                     ; user WCS loaded flag field
                                    0040
                                    0040
                          00000000  0040   CODE_00         =^X0                    ; halt code equates
                          00000001  0040   CODE_01         =^X1
                          00000002  0040   CODE_02         =^X2
                          00000003  0040   CODE_03         =^X3
                          00000004  0040   CODE_04         =^X4
                          00000005  0040   CODE_05         =^X5
                          00000006  0040   CODE_06         =^X6
                          00000007  0040   CODE_07         =^X7
                          00000008  0040   CODE_08         =^X8
                          00000009  0040   CODE_09         =^X9
                          0000000A  0040   CODE_0A         =^XA
                          0000000B  0040   CODE_0B         =^XB
                          0000000C  0040   CODE_0C         =^XC
                                    0040
                          00000080  0040   BUFSIZ          =128
                                    0040
                          00000100  0040   RESTART         =^X100                  ; label for memory loc 100
0000003C'9F   02    C8              0040   JUMP:   BISL2   #M_DONE,@#L_FLAGS       ; code to set done and go to routine
     00000C06'9F    17              0047           JMP     @#READ_GPR              ; to read all GPR's after a halt
                                    004D
```

```
                                     004D   177 .SBTTL INSTRUCION MESSAGES
                                     004D   178 ;--------------------------------------------------------------------------
                                     004D   179 T_NO_KA730:
69 76 65 64 20 6F 4E 20 20 2F 21 00' 004D   180         .ASCIC  "!/  No devices of type KA730 selected.  Exiting test.!/"
20 65 70 79 74 20 66 6F 20 73 65 63  0059
74 63 65 6C 65 73 20 30 33 37 41 4B  0065
67 6E 69 74 69 78 45 20 20 2E 64 65  0071
         2F 21 2E 74 73 65 74 20     007D
                                 37  004D
                                     0085   181 ;--------------------------------------------------------------------------
                                     0085   182 T_INSTRUCTIONS:
65 70 78 65 20 54 4C 41 48 2F 21 00' 0085   183         .ASCIC  "!/HALT expected with the following printout:!/"-
68 74 20 68 74 69 77 20 64 65 74 63  0091
20 67 6E 69 77 6F 6C 6C 6F 66 20 65  009D
3F 2F 21 3A 74 75 6F 74 6E 69 72 70  00A9
20 4C 58 21 3D 43 50 20 20 42 58 21  00B5
                              2F 21  00C1
                                 3D  0085
                                     00C3   184                 "?!XB  PC=!XL !/"
                                     00C3   185
                                     00C3   186 ;--------------------------------------------------------------------------
                                     00C3   187 T_CONTINUE:
65 75 6E 69 74 6E 6F 63 20 6F 54 00' 00C3   188         .ASCIC  "To continue from console mode do the following:!/"-
6C 6F 73 6E 6F 63 20 6D 6F 72 66 20  00CF
68 74 20 6F 64 20 65 64 6F 6D 20 65  00DB
3A 67 6E 69 77 6F 6C 6C 6F 66 20 65  00E7
                              2F 21  00F3
43 3C 20 30 30 31 20 46 20 47 2F 44  00F5   189                 "D/G F 100 <CR> and then C <CR> "
20 6E 65 68 74 20 64 6E 61 20 3E 52  0101
            20 3E 52 43 3C 20 43     010D
                                 50  00C3
                                     0114   190 ;--------------------------------------------------------------------------
                                     0114   191 T_EXITING:
4C 41 48 20 67 6E 69 74 69 78 45 00' 0114   192         .ASCIC  "Exiting HALT test.!/"
         2F 21 2E 74 73 65 74 20 54  0120
                                 14  0114
                                     0129   193 ;--------------------------------------------------------------------------
                                     0129   194 T_WARNING:
20 3A 47 4E 49 4E 52 41 57 2F 21 00' 0129   195         .ASCIC  "!/WARNING: The AUTO RESTART switch must be in the OFF!/"-
53 45 52 20 4F 54 55 41 20 65 68 54  0135
20 68 63 74 69 77 73 20 54 52 41 54  0141
74 20 6E 69 20 65 62 20 74 73 75 6D  014D
         2F 21 46 46 4F 20 65 68     0159
20 6E 6F 69 74 69 73 6F 70 20 20 09  0161   196                 "         position for this test to operate properly.!/"
73 65 74 20 73 69 68 74 20 72 6F 66  016D
65 74 61 72 65 70 6F 20 6F 74 20 74  0179
2F 21 2E 79 6C 72 65 70 6F 72 70 20  0185
                                 67  0129
                                     0191   197 ;--------------------------------------------------------------------------
                                     0191   198 T_REST_OFF:
4F 54 55 41 20 65 68 74 20 73 49 00' 0191   199         .ASCIC  "Is the AUTO RESTART switch in the off position?"
69 77 73 20 54 52 41 54 53 45 52 20  019D
6F 20 65 68 74 20 6E 69 20 68 63 74  01A9
3F 6E 6F 69 74 69 73 6F 70 20 66 66  01B5
                                 2F  0191
                                     01C1   200 ;--------------------------------------------------------------------------
```

```
                                       01C1     202 .SBTTL  ERROR MESSAGES
                                       01C1     203 ;-----------------------------------------------------------------------------
                                       01C1     204 T_HALT_MESS:
20 64 65 74 70 6D 65 74 74 41 20 00'   01C1     205         .ASCIC  " Attempted to halt the processor by executing!/"
20 65 68 74 20 74 6C 61 68 20 6F 74    01CD
79 62 20 72 6F 73 73 65 63 6F 72 70    01D9
2F 21 67 6E 69 74 75 63 65 78 65 20    01E5
                                  2F   01C1
                                       01F1     206 ;-----------------------------------------------------------------------------
                                       01F1     207 T_HALT_ERR:
6F 63 20 6F 72 63 61 6D 20 61 20 00'   01F1     208         .ASCIC  " a macro code HALT instruction.!/!/"
74 73 6E 69 20 54 4C 41 48 20 65 64    01FD
2F 21 2F 21 2E 6E 6F 69 74 63 75 72    0209
                                  23   01F1
                                       0215     209 ;-----------------------------------------------------------------------------
                                       0215     210 T_INVLDIS_ERR:
73 6E 69 20 43 46 58 20 6E 61 20 00'   0215     211         .ASCIC  " an XFC inst with the IS pointing to a protected page.!/!/"
49 20 65 68 74 20 68 74 69 77 20 74    0221
74 20 67 6E 69 74 6E 69 6F 70 20 53    022D
65 74 63 65 74 6F 72 70 20 61 20 6F    0239
   2F 21 2F 21 2E 65 67 61 70 20 64    0245
                                  3A   0215
                                       0250     212 ;-----------------------------------------------------------------------------
                                       0250     213 T_NXMIS_ERR:
73 6E 69 20 43 46 58 20 6E 61 20 00'   0250     214         .ASCIC  " an XFC inst with the IS pointing to nonexistent memory.!/!/"
49 20 65 68 74 20 68 74 69 77 20 74    025C
74 20 67 6E 69 74 6E 69 6F 70 20 53    0268
6E 65 74 73 69 78 65 6E 6F 6E 20 6F    0274
21 2F 21 2E 79 72 6F 6D 65 6D 20 74    0280
                                  2F   028C
                                  3C   0250
                                       028D     215 ;-----------------------------------------------------------------------------
                                       028D     216 T_CHMU_ERR:
73 6E 69 20 55 4D 48 43 20 61 20 00'   028D     217         .ASCIC  " a CHMU instruction with PSL<IS>=1.!/!/"
74 69 77 20 6E 6F 69 74 63 75 72 74    0299
2E 31 3D 3E 53 49 3C 4C 53 50 20 68    02A5
                        2F 21 2F 21    02B1
                                  27   028D
                                       02B5     218 ;-----------------------------------------------------------------------------
                                       02B5     219 T_CHMS_ERR:
73 6E 69 20 53 4D 48 43 20 61 20 00'   02B5     220         .ASCIC  " a CHMS instruction with PSL<IS>=1.!/!/"
74 69 77 20 6E 6F 69 74 63 75 72 74    02C1
2E 31 3D 3E 53 49 3C 4C 53 50 20 68    02CD
                        2F 21 2F 21    02D9
                                  27   02B5
                                       02DD     221 ;-----------------------------------------------------------------------------
                                       02DD     222 T_CHME_ERR:
73 6E 69 20 45 4D 48 43 20 61 20 00'   02DD     223         .ASCIC  " a CHME instruction with PSL<IS>=1.!/!/"
74 69 77 20 6E 6F 69 74 63 75 72 74    02E9
2E 31 3D 3E 53 49 3C 4C 53 50 20 68    02F5
                        2F 21 2F 21    0301
                                  27   02DD
                                       0305     224 ;-----------------------------------------------------------------------------
                                       0305     225 T_CHMK_ERR:
73 6E 69 20 4B 4D 48 43 20 61 20 00'   0305     226         .ASCIC  " a CHMK instruction with PSL<IS>=1.!/!/"
74 69 77 20 6E 6F 69 74 63 75 72 74    0311
2E 31 3D 3E 53 49 3C 4C 53 50 20 68    031D
```

```
                   2F 21 2F 21  0329
                            27  0305
                                032D     227 ;-----------------------------------------------------------------------------------
                                032D     228 T_SCB_ERR:
73 6E 69 20 43 46 58 20 6E 61 20 00'  032D     229         .ASCIC  " an XFC inst with the SCB vector entry <1:0> = 3.!/!/"
53 20 65 68 74 20 68 74 69 77 20 74   0339
6E 65 20 72 6F 74 63 65 76 20 42 43   0345
20 3D 20 3E 30 3A 31 3C 20 79 72 74   0351
                  2F 21 2F 21 2E 33   035D
                                 35   032D
                                      0363     230 ;-----------------------------------------------------------------------------------
                                      0363     231 T_SCBBNXM_ERR:
73 6E 69 20 43 46 58 20 6E 61 20 00'  0363     232         .ASCIC  " an XFC inst with SCBB pointing to non-existent memory.!/!/"
20 42 42 43 53 20 68 74 69 77 20 74   036F
20 6F 74 20 67 6E 69 74 6E 69 6F 70   037B
74 6E 65 74 73 69 78 65 2D 6E 6F 6E   0387
2F 21 2F 21 2E 79 72 6F 6D 65 6D 20   0393
                                 3B   0363
                                      039F     233 ;-----------------------------------------------------------------------------------
                                      039F     234 T_WCS_ERR:
73 6E 69 20 43 46 58 20 6E 61 20 00'  039F     235         .ASCIC  " an XFC inst with SCB vector entry <1:0>=2!/"-
76 20 42 43 53 20 68 74 69 77 20 74   03AB
20 79 72 74 6E 65 20 72 6F 74 63 65   03B7
         2F 21 32 3D 3E 30 3A 31 3C   03C3
73 69 64 20 53 43 57 20 64 6E 61 20   03CC     236                 " and WCS disabled or not present!/!/."
74 6F 6E 20 72 6F 20 64 65 6C 62 61   03D8
2F 21 2F 21 74 6E 65 73 65 72 70 20   03E4
                                 2E   03F0
                                 51   039F
                                      03F1     237 ;-----------------------------------------------------------------------------------
                                      03F1     238 T_CHMUSCB_ERR:
73 6E 69 20 55 4D 48 43 20 61 20 00'  03F1     239         .ASCIC  " a CHMU inst with the SCB vector entry <1:0> = 1 .!/!/"
53 20 65 68 74 20 68 74 69 77 20 74   03FD
6E 65 20 72 6F 74 63 65 76 20 42 43   0409
20 3D 20 3E 30 3A 31 3C 20 79 72 74   0415
               2F 21 2F 21 2E 20 31   0421
                                 36   03F1
                                      0428     240 ;-----------------------------------------------------------------------------------
                                      0428     241 T_CHMSSCB_ERR:
73 6E 69 20 53 4D 48 43 20 61 20 00'  0428     242         .ASCIC  " a CHMS inst with the SCB vector entry <1:0> = 1 .!/!/"
53 20 65 68 74 20 68 74 69 77 20 74   0434
6E 65 20 72 6F 74 63 65 76 20 42 43   0440
20 3D 20 3E 30 3A 31 3C 20 79 72 74   044C
               2F 21 2F 21 2E 20 31   0458
                                 36   0428
                                      045F     243 ;-----------------------------------------------------------------------------------
                                      045F     244 T_CHMESCB_ERR:
73 6E 69 20 45 4D 48 43 20 61 20 00'  045F     245         .ASCIC  " a CHME inst with the SCB vector entry <1:0> = 1 .!/!/"
53 20 65 68 74 20 68 74 69 77 20 74   046B
6E 65 20 72 6F 74 63 65 76 20 42 43   0477
20 3D 20 3E 30 3A 31 3C 20 79 72 74   0483
               2F 21 2F 21 2E 20 31   048F
                                 36   045F
                                      0496     246 ;-----------------------------------------------------------------------------------
                                      0496     247 T_CHMKSCB_ERR:
73 6E 69 20 4B 4D 48 43 20 61 20 00'  0496     248         .ASCIC  " a CHMK inst with the SCB vector entry <1:0> = 1 .!/!/"
53 20 65 68 74 20 68 74 69 77 20 74   04A2
```

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6E 65 20 72 6F 74 63 65 76 20 42 43  04AE
20 3D 20 3E 30 3A 31 3C 20 79 72 74  04BA
               2F 21 2F 21 2E 20 31  04C6
                                 36  0496
                                     04CD   249 ;----------------------------------------------------------------------------
                                     04CD   250 T_DBL_MCHK_ERR:
63 6E 65 72 65 66 65 72 20 61 20 00' 04CD   251         .ASCIC  " a reference to NXM with vector pointing to NXM location.!/!/"
74 69 77 20 4D 58 4E 20 6F 74 20 65  04D9
69 6F 70 20 72 6F 74 63 65 76 20 68  04E5
4D 58 4E 20 6F 74 20 67 6E 69 74 6E  04F1
2F 21 2E 6E 6F 69 74 61 63 6F 6C 20  04FD
                              2F 21  0509
                                 3D  04CD
                                     050B   252 ;----------------------------------------------------------------------------
                                     050B   253 T_NXM_WCS_ERR:
72 65 66 73 6E 61 72 74 20 61 20 00' 050B   254         .ASCIC  " a transfer to user WCS which has not been loaded.!/!/"
53 43 57 20 72 65 73 75 20 6F 74 20  0517
6E 20 73 61 68 20 68 63 69 68 77 20  0523
64 61 6F 6C 20 6E 65 65 62 20 74 6F  052F
               2F 21 2F 21 2E 64 65  053B
                                 36  050B
                                     0542   255 ;----------------------------------------------------------------------------
                                     0542   256 T_NOT_READY:
72 74 73 6E 69 20 74 73 65 54 20 00' 0542   257         .ASCIC  " Test instruction was not ready to be executed.!/"
6E 20 73 61 77 20 6E 6F 69 74 63 75  054E
20 6F 74 20 79 64 61 65 72 20 74 6F  055A
2E 64 65 74 75 63 65 78 65 20 65 62  0566
                              2F 21  0572
                                 31  0542
                                     0574   258 ;----------------------------------------------------------------------------
                                     0574   259 T_NOT_DONE:
6C 66 20 74 72 61 74 73 65 52 20 00' 0574   260         .ASCIC  " Restart flag was not set while restarting.!/"
73 20 74 6F 6E 20 73 61 77 20 67 61  0580
73 65 72 20 65 6C 69 68 77 20 74 65  058C
      2F 21 2E 67 6E 69 74 72 61 74  0598
                                 2D  0574
                                     05A2   261 ;----------------------------------------------------------------------------
                                     05A2   262 T_EXECUTE:
72 74 73 6E 69 20 74 73 65 54 20 00' 05A2   263         .ASCIC  " Test instruction execution error.!/"
75 63 65 78 65 20 6E 6F 69 74 63 75  05AE
21 2E 72 6F 72 72 65 20 6E 6F 69 74  05BA
                                 2F  05C6
                                 24  05A2
                                     05C7   264 ;----------------------------------------------------------------------------
                                     05C7   265 T_XFC:
75 72 74 73 6E 69 20 43 46 58 20 00' 05C7   266         .ASCIC  " XFC instruction executed instead of causing halt.!/"
74 75 63 65 78 65 20 6E 6F 69 74 63  05D3
6F 20 64 61 65 74 73 6E 69 20 64 65  05DF
61 68 20 67 6E 69 73 75 61 63 20 66  05EB
                     2F 21 2E 74 6C  05F7
                                 34  05C7
                                     05FC   267 ;----------------------------------------------------------------------------
                                     05FC   268 T_CHMX_ERR:
72 74 73 6E 69 20 78 4D 48 43 20 00' 05FC   269         .ASCIC  " CHMx instruction executed instead of causing halt.!/"
75 63 65 78 65 20 6E 6F 69 74 63 75  0608
20 64 61 65 74 73 6E 69 20 64 65 74  0614
68 20 67 6E 69 73 75 61 63 20 66 6F  0620
```

```
                 2F 21 2E 74 6C 61  062C
                                35  05FC
                                    0632   270 ;--------------------------------------------------------------------------
                                    0632   271 T_TIMER:
64 65 74 63 65 70 78 65 6E 55 20 00' 0632   272         .ASCIC  " Unexpected interval timer interrupt.!/"
69 74 20 6C 61 76 72 65 74 6E 69 20  063E
70 75 72 72 65 74 6E 69 20 72 65 6D  064A
                       2F 21 2E 74  0656
                                27  0632
                                    065A   273 ;--------------------------------------------------------------------------
                                    065A   274 T_KSP_ERR1:
63 6E 69 20 73 69 20 50 53 4B 20 00' 065A   275         .ASCIC  " KSP is incorrect  -   EXP = !XL  ACT = !XL!/"
20 20 20 2D 20 20 74 63 65 72 72 6F  0666
41 20 20 4C 58 21 20 3D 20 50 58 45  0672
      2F 21 4C 58 21 20 3D 20 54 43  067E
                                2D  065A
                                    0688   276 ;--------------------------------------------------------------------------
                                    0688   277 T_KSP_ERR2:
20 20 20 2D 20 20 20 50 53 4B 20 00' 0688   278         .ASCIC  " KSP    -   EXP =(UNPREDICTABLE)   ACT = !XL!/"
44 45 52 50 4E 55 28 3D 20 50 58 45  0694
41 20 20 20 29 45 4C 42 41 54 43 49  06A0
      2F 21 4C 58 21 20 3D 20 54 43  06AC
                                2D  0688
                                    06B6   279 ;--------------------------------------------------------------------------
                                    06B6   280 T_ISP_ERR1:
63 6E 69 20 73 69 20 50 53 49 20 00' 06B6   281         .ASCIC  " ISP is incorrect  -   EXP = !XL  ACT = !XL!/"
20 20 20 2D 20 20 74 63 65 72 72 6F  06C2
41 20 20 4C 58 21 20 3D 20 50 58 45  06CE
      2F 21 4C 58 21 20 3D 20 54 43  06DA
                                2D  06B6
                                    06E4   282 ;--------------------------------------------------------------------------
                                    06E4   283 T_ISP_ERR2:
20 20 20 2D 20 20 20 50 53 49 20 00' 06E4   284         .ASCIC  " ISP    -   EXP =(UNPREDICTABLE)   ACT = !XL!/"
44 45 52 50 4E 55 28 3D 20 50 58 45  06F0
41 20 20 20 29 45 4C 42 41 54 43 49  06FC
      2F 21 4C 58 21 20 3D 20 54 43  0708
                                2D  06E4
                                    0712   285 ;--------------------------------------------------------------------------
                                    0712   286 T_SP_ERR1:
6F 63 6E 69 20 73 69 20 50 53 20 00' 0712   287         .ASCIC  " SP is incorrect   -   EXP = !XL  ACT = !XL!/"
20 20 20 2D 20 20 20 74 63 65 72 72  071E
41 20 20 4C 58 21 20 3D 20 50 58 45  072A
      2F 21 4C 58 21 20 3D 20 54 43  0736
                                2D  0712
                                    0740   288 ;--------------------------------------------------------------------------
                                    0740   289 T_SP_ERR2:
2F 21 4C 58 21 20 3D 20 50 53 20 00' 0740   290         .ASCIC  " SP = !XL!/"
                                0B  0740
                                    074C   291 ;--------------------------------------------------------------------------
                                    074C   292 T_GPR_ERR:
69 20 61 74 61 64 20 64 61 42 20 00' 074C   293         .ASCIC  " Bad data in general purpose register:!/"
75 70 20 6C 61 72 65 6E 65 67 20 6E  0758
74 73 69 67 65 72 20 65 73 6F 70 72  0764
               2F 21 3A 72 65  0770
                                28  074C
                                    0775   294 ;--------------------------------------------------------------------------
                                    0775   295 T_BAD_DATA:
```

```
20 4C 58 21 20 3D 20 50 58 45 20 00'  0775     296             .ASCIC  '' EXP = !XL    ACT = !XL    XOR= !XL !/''
4C 58 21 20 3D 20 54 43 41 20 20 20   0781
4C 58 21 20 3D 52 4F 58 20 20 20 20   078D
                            2F 21 20  0799
                                  26  0775
                                      079C     297 ;-----------------------------------------------------------------------
                                      079C     298 T_GOOD_DATA:
20 4C 58 21 20 3D 20 50 58 45 20 00'  079C     299             .ASCIC  '' EXP = !XL    ACT = !XL !/''
4C 58 21 20 3D 20 54 43 41 20 20 20   07A8
                            2F 21 20  07B4
                                  1A  079C
                                      07B7     300 ;-----------------------------------------------------------------------
                                      07B7     301 T_PAGE0PROT:
20 6F 74 20 65 6C 62 61 6E 55 20 00'  07B7     302             .ASCIC  '' Unable to set proper protection on page 0.!/''
70 20 72 65 70 6F 72 70 20 74 65 73   07C3
6E 6F 20 6E 6F 69 74 63 65 74 6F 72   07CF
      2F 21 2E 30 20 65 67 61 70 20   07DB
                                  2D  07B7
                                      07E5     303 ;-----------------------------------------------------------------------
                                      07E5     304 T_PAGEPROT:
20 6F 74 20 65 6C 62 61 6E 55 20 00'  07E5     305             .ASCIC  '' Unable to set proper protection on buffer page.!/''
70 20 72 65 70 6F 72 70 20 74 65 73   07F1
6E 6F 20 6E 6F 69 74 63 65 74 6F 72   07FD
65 67 61 70 20 72 65 66 66 75 62 20   0809
                            2F 21 2E  0815
                                  32  07E5
                                      0818     306 ;-----------------------------------------------------------------------
                                      0818     307 T_NOT_ON_KS:
72 65 4B 20 6E 6F 20 74 6F 4E 20 00'  0818     308             .ASCIC  '' Not on Kernel Stack as expected.!/''
73 61 20 6B 63 61 74 53 20 6C 65 6E   0824
2F 21 2E 64 65 74 63 65 70 78 65 20   0830
                                  23  0818
                                      083C     309 ;-----------------------------------------------------------------------
                                      083C     310 T_NOT_ON_IS:
74 6E 49 20 6E 6F 20 74 6F 4E 20 00'  083C     311             .ASCIC  '' Not on Interrupt Stack as expected.!/''
6B 63 61 74 53 20 74 70 75 72 72 65   0848
64 65 74 63 65 70 78 65 20 73 61 20   0854
                            2F 21 2E  0860
                                  26  083C
                                      0863     312 ;-----------------------------------------------------------------------
                                      0863     313 T_EXP_PSL:
50 20 64 65 74 63 65 70 78 45 20 00'  0863     314             .ASCIC  '' Expected PSL    =    !_!XL(X) ; !AC!/''
21 5F 21 20 20 20 3D 20 20 20 4C 53   086F
21 43 41 21 20 3B 20 29 58 28 4C 58   087B
                                  2F  0887
                                  24  0863
                                      0888     315 ;-----------------------------------------------------------------------
                                      0888     316 T_ACT_PSL:
4C 53 50 20 6C 61 75 74 63 41 20 00'  0888     317             .ASCIC  '' Actual PSL      =    !_!XL(X) ; !AC!/''
21 5F 21 20 20 20 3D 20 20 20 20 20   0894
21 43 41 21 20 3B 20 29 58 28 4C 58   08A0
                                  2F  08AC
                                  24  0888
                                      08AD     318 ;-----------------------------------------------------------------------
                                      08AD     319 T_PSL:
20 20 20 3D 20 20 20 4C 53 50 20 00'  08AD     320             .ASCIC  '' PSL    =     !_!XL (X) ; !AC!/''
20 3B 20 29 58 28 20 4C 58 21 5F 21   08B9
```

```
                  2F 21 43 41 21  08C5
                              1C  08AD
                                  08CA   321 ;-----------------------------------------------------------------------------
                                  08CA   322 T_GPR:
20 20 72 65 74 73 69 67 65 52 20 00' 08CA   323          .ASCIC  " Register  Expected    Actual      XOR!/"
20 20 20 20 64 65 74 63 65 70 78 45  08D6
58 20 20 20 20 20 6C 61 75 74 63 41  08E2
                     2F 21 52 4F  08EE
                              27  08CA
                                  08F2   324 ;-----------------------------------------------------------------------------
                                  08F2   325 T_XOR:
4C 58 21 20 20 5F 21 43 41 21 20 00' 08F2   326          .ASCIC  " !AC!_  !XL   !XL   !XL!/"
4C 58 21 20 20 20 4C 58 21 20 20 20  08FE
                           2F 21  090A
                              19  08F2
                                  090C   327 ;-----------------------------------------------------------------------------
                                  090C   328 T_NOXOR:
4C 58 21 20 20 5F 21 43 41 21 20 00' 090C   329          .ASCIC  " !AC!_  !XL   !XL!/"
         2F 21 4C 58 21 20 20 20  0918
                              13  090C
                                  0920   330 ;-----------------------------------------------------------------------------
2A 2A 2A 2A 2A 2A 2A 2A 2A 2A 2A 00' 0920   331 MM_MSG: .ASCIC  "************* UNABLE TO TURN MEMORY MANAGEMENT OFF *********"
4F 54 20 45 4C 42 41 4E 55 20 2A 2A  092C
59 52 4F 4D 45 4D 20 4E 52 55 54 20  0938
20 54 4E 45 4D 45 47 41 4E 41 4D 20  0944
2A 2A 2A 2A 2A 2A 2A 2A 20 46 46 4F  0950
                              2A  095C
                              3C  0920
                                  095D   332
                                  095D   333 ;-----------------------------------------------------------------------------
```

```
                             095D   335 .SBTTL  DATA TABLES
                             095D   336
                             095D   337 ; Table for test 1
                             095D   338
                   00000000  095D   339 DATA_1:          .LONG    ^X0                 ; expected manual restart PSL
                             0961   340
                   041F0000  0961   341 DATA_2:          .LONG    ^X41F0000           ; expected PSL
                             0965   342
                   041F0008  0965   343 DATA_3:          .LONG    ^X41F0008           ; expected PSL
                             0969   344
                             0969   345
                             0969   346
                             0969   347
                             0969   348 ERR_MESSAGE:
                             0969   349         $DS_BGNMESSAGE
                       0000  0969                    .WORD    ^M<>                ; ENTRY MASK
5E    00000084 8F       C2   096B   350         SUBL2    #BUFSIZ+4,SP                 ; Reserve room on stack for cvtreg
           52    5E     D0   0972   351         MOVL     SP,R2                        ; Save starting address of buffer
                             0975   352         $DS_PRINTB_S     FORMAT=T_HALT_MESS
         F848 CF        9F   0975                    PUSHAB   T_HALT_MESS
000100E0 9F    01       FB   0979                    CALLS    #$$N, @#DS$PRINTB
                             0980   353         $DS_PRINTB_S     FORMAT=@ERR$_P1(AP)
             14 BC      9F   0980                    PUSHAB   @ERR$_P1(AP)
000100E0 9F    01       FB   0983                    CALLS    #$$N, @#DS$PRINTB
  0B F6AD CF   00       E0   098A   354         BBS      #V_READY,L_FLAGS,1$          ; br = instruction ready to execute
                             0990   355         $DS_PRINTB_S     FORMAT=T_NOT_READY
         FBAE CF        9F   0990                    PUSHAB   T_NOT_READY
000100E0 9F    01       FB   0994                    CALLS    #$$N, @#DS$PRINTB
  0B F69C CF   01       E0   099B   356 1$:     BBS      #V_DONE,L_FLAGS,2$           ; br = normal restart
                             09A1   357         $DS_PRINTB_S     FORMAT=T_NOT_DONE
         FBCF CF        9F   09A1                    PUSHAB   T_NOT_DONE
000100E0 9F    01       FB   09A5                    CALLS    #$$N, @#DS$PRINTB
  0B F68B CF   02       E1   09AC   358 2$:     BBC      #V_EXECUTE_ERR,L_FLAGS,3$ ; br = instruction executed
                             09B2   359         $DS_PRINTB_S     FORMAT=T_EXECUTE
         FBEC CF        9F   09B2                    PUSHAB   T_EXECUTE
000100E0 9F    01       FB   09B6                    CALLS    #$$N, @#DS$PRINTB
  0B F67A CF   03       E1   09BD   360 3$:     BBC      #V_CHMX_ERR,L_FLAGS,4$ ; br = no CHMx error
                             09C3   361         $DS_PRINTB_S     FORMAT=T_CHMX_ERR
         FC35 CF        9F   09C3                    PUSHAB   T_CHMX_ERR
000100E0 9F    01       FB   09C7                    CALLS    #$$N, @#DS$PRINTB
  0B F669 CF   04       E1   09CE   362 4$:     BBC      #V_XFC_ERR,L_FLAGS,5$    ; br = no XFC error
                             09D4   363         $DS_PRINTB_S     FORMAT=T_XFC
         FBEF CF        9F   09D4                    PUSHAB   T_XFC
000100E0 9F    01       FB   09D8                    CALLS    #$$N, @#DS$PRINTB
  1F F658 CF   10       E1   09DF   364 5$:     BBC      #V_ISTK,L_FLAGS,6$       ; br = on kernel stack
  2A F652 CF   0D       E1   09E5   365         BBC      #V_KSP_ERR,L_FLAGS,7$    ; br = no KSP error
                             09EB   366         $DS_PRINTB_S     FORMAT=T_KSP_ERR1,P0=L_EXP_KSP,P1=L_ACT_KSP
      00000000'EF       DD   09EB                    PUSHL    L_ACT_KSP
      00000000'EF       DD   09F1                    PUSHL    L_EXP_KSP
         FC5F CF        9F   09F7                    PUSHAB   T_KSP_ERR1
000100E0 9F    03       FB   09FB                    CALLS    #$$N, @#DS$PRINTB
             11         11   0A02   367         BRB      7$
                             0A04   368 6$:     $DS_PRINTX_S     FORMAT=T_KSP_ERR2,P0=L_ACT_KSP
      00000000'EF       DD   0A04                    PUSHL    L_ACT_KSP
         FC7A CF        9F   0A0A                    PUSHAB   T_KSP_ERR2
000100E8 9F    02       FB   0A0E                    CALLS    #$$N, @#DS$PRINTX
  1F F622 CF   10       E0   0A15   369 7$:     BBS      #V_ISTK,L_FLAGS,8$       ; br = on interrupt stack
```

```
          2A F61C CF    0E   E1  0A1B   370          BBC      #V_ISP_ERR,L_FLAGS,9$    ; br = no ISP error
                                 0A21   371          $DS_PRINTB_S     FORMAT=T_ISP_ERR1,P0=L_EXP_ISP,P1=L_ACT_ISP
            00000000'EF      DD  0A21                         PUSHL    L_ACT_ISP
            00000000'EF      DD  0A27                         PUSHL    L_EXP_ISP
                FC85 CF      9F  0A2D                         PUSHAB   T_ISP_ERR1
       000100E0 9F      03   FB  0A31                         CALLS    #$$N, @#DS$PRINTB
                        11   11  0A38   372          BRB      9$                       ; skip extened error report
                                 0A3A   373 8$:      $DS_PRINTX_S     FORMAT=T_ISP_ERR2,P0=L_ACT_ISP
            00000000'EF      DD  0A3A                         PUSHL    L_ACT_ISP
                FCA0 CF      9F  0A40                         PUSHAB   T_ISP_ERR2
       000100E8 9F      02   FB  0A44                         CALLS    #$$N, @#DS$PRINTX
          19 F5EC CF    0F   E1  0A4B   374 9$:      BBC      #V_SP_ERR,L_FLAGS,10$    ; br = no SP error
                                 0A51   375          $DS_PRINTB_S     FORMAT=T_SP_ERR1,P0=L_EXP_SP,P1=L_ACT_SP
            00000000'EF      DD  0A51                         PUSHL    L_ACT_SP
            00000000'EF      DD  0A57                         PUSHL    L_EXP_SP
                FCB1 CF      9F  0A5D                         PUSHAB   T_SP_ERR1
       000100E0 9F      03   FB  0A61                         CALLS    #$$N, @#DS$PRINTB
                        11   11  0A68   376          BRB      11$                      ; skip extended error report
                                 0A6A   377 10$:     $DS_PRINTX_S     FORMAT=T_SP_ERR2,P0=L_ACT_SP
            00000000'EF      DD  0A6A                         PUSHL    L_ACT_SP
                FCCC CF      9F  0A70                         PUSHAB   T_SP_ERR2
       000100E8 9F      02   FB  0A74                         CALLS    #$$N, @#DS$PRINTX
          03 F5BC CF    09   E0  0A7B   378 11$:     BBS      #V_PSL_ERR,L_FLAGS,12$   ; br = PSL error
                      008A   31  0A81   379          BRW      13$                      ; no PSL error
                                 0A84   380 12$:     $DS_CVTREG_S     MSB=#31,DATA=L_EXP_PSL,MNEADR=A_PSLMNE,-
                                 0A84   381                           STRBUF=(R2),MAXLEN=#BUFSIZ,-
                                 0A84   382                           V1=MODELIST,V2=MODELIST
                        00   DD  0A84                         PUSHL    #0
                        00   DD  0A86                         PUSHL    #0
                        00   DD  0A88                         PUSHL    #0
                        00   DD  0A8A                         PUSHL    #0
            00000000'EF      DF  0A8C                         PUSHAL   MODELIST
            00000000'EF      DF  0A92                         PUSHAL   MODELIST
            00000080 8F      DD  0A98                         PUSHL    #BUFSIZ
                      62     9F  0A9E                         PUSHAB   (R2)
            00000000'EF      9F  0AA0                         PUSHAB   A_PSLMNE
            00000000'EF      DD  0AA6                         PUSHL    L_EXP_PSL
                      1F     DD  0AAC                         PUSHL    #31
       000100B0 9F      0B   FB  0AAE                         CALLS    #11, @#DS$CVTREG
                                 0AB5   383          $DS_PRINTB_S     FORMAT=T_EXP_PSL,P0=L_EXP_PSL,P1=R2
                      52     DD  0AB5                         PUSHL    R2
            00000000'EF      DD  0AB7                         PUSHL    L_EXP_PSL
                FDA2 CF      9F  0ABD                         PUSHAB   T_EXP_PSL
       000100E0 9F      03   FB  0AC1                         CALLS    #$$N, @#DS$PRINTB
                                 0AC8   384          $DS_CVTREG_S     MSB=#31,DATA=L_ACT_PSL,MNEADR=A_PSLMNE,-
                                 0AC8   385                           STRBUF=(R2),MAXLEN=#BUFSIZ,-
                                 0AC8   386                           V1=MODELIST,V2=MODELIST
                        00   DD  0AC8                         PUSHL    #0
                        00   DD  0ACA                         PUSHL    #0
                        00   DD  0ACC                         PUSHL    #0
                        00   DD  0ACE                         PUSHL    #0
            00000000'EF      DF  0AD0                         PUSHAL   MODELIST
            00000000'EF      DF  0AD6                         PUSHAL   MODELIST
            00000080 8F      DD  0ADC                         PUSHL    #BUFSIZ
                      62     9F  0AE2                         PUSHAB   (R2)
            00000000'EF      9F  0AE4                         PUSHAB   A_PSLMNE
            00000000'EF      DD  0AEA                         PUSHL    L_ACT_PSL
```

```
                  1F   DD  0AF0                         PUSHL   #31
     000100B0 9F  0B   FB  0AF2                         CALLS   #11, @#DS$CVTREG
                           0AF9   387        $DS_PRINTB_S       FORMAT=T_ACT_PSL,P0=L_ACT_PSL,P1=R2
                  52   DD  0AF9                         PUSHL   R2
          00000000'EF  DD  0AFB                         PUSHL   L_ACT_PSL
              FD83 CF  9F  0B01                         PUSHAB  T_ACT_PSL
     000100E0 9F  03   FB  0B05                         CALLS   #$$N, @#DS$PRINTB
                  44   11  0B0C   388        BRB        14$
                           0B0E   389 13$:   $DS_CVTREG_S       MSB=#31,DATA=L_EXP_PSL,MNEADR=A_PSLMNE,-
                           0B0E   390                           STRBUF=(R2),MAXLEN=#BUFSIZ,-
                           0B0E   391                           V1=MODELIST,V2=MODELIST
                  00   DD  0B0E                         PUSHL   #0
                  00   DD  0B10                         PUSHL   #0
                  00   DD  0B12                         PUSHL   #0
                  00   DD  0B14                         PUSHL   #0
          00000000'EF  DF  0B16                         PUSHAL  MODELIST
          00000000'EF  DF  0B1C                         PUSHAL  MODELIST
          00000080 8F  DD  0B22                         PUSHL   #BUFSIZ
                  62   9F  0B28                         PUSHAB  (R2)
          00000000'EF  9F  0B2A                         PUSHAB  A_PSLMNE
          00000000'EF  DD  0B30                         PUSHL   L_EXP_PSL
                  1F   DD  0B36                         PUSHL   #31
     000100B0 9F  0B   FB  0B38                         CALLS   #11, @#DS$CVTREG
                           0B3F   392        $DS_PRINTX_S       FORMAT=T_PSL,P0=L_EXP_PSL,P1=R2
                  52   DD  0B3F                         PUSHL   R2
          00000000'EF  DD  0B41                         PUSHL   L_EXP_PSL
              FD62 CF  9F  0B47                         PUSHAB  T_PSL
     000100E8 9F  03   FB  0B4B                         CALLS   #$$N, @#DS$PRINTX
      5C F4E5 CF  0A   E1  0B52   393 14$:   BBC        #V_GPR_ERR,L_FLAGS,18$ ; br = no GPR error
                           0B58   394        $DS_PRINTB_S       FORMAT=T_GPR
              FD6E CF  9F  0B58                         PUSHAB  T_GPR
     000100E0 9F  01   FB  0B5C                         CALLS   #$$N, @#DS$PRINTB
     53   00000000'EF  DE  0B63   395        MOVAL      GPR_TABLE,R3                  ; load address of expected data
     54   00000000'EF  D0  0B6A   396        MOVL       A_HALT_BUFFER,R4              ; load address of actual data
                  55   7C  0B71   397        CLRQ       R5                            ; init R5 and R6 for counter and data
              57  0D   D0  0B73   398        MOVL       #13,R7                        ; load limit
   58   00000000'EF45  DE  0B76   399 15$:   MOVAL      REG_TABLE[R5],R8              ; load address of ascic string
   56    6445    6345  CD  0B7E   400        XORL3      (R3)[R5],(R4)[R5],R6          ; get XOR of data if bad
                  17   13  0B84   401        BEQL       16$                           ; br = good data
                           0B86   402        $DS_PRINTB_S       FORMAT=T_XOR,P0=R8,P1=(R3)[R5],P2=(R4)[R5],P3=R6
                  56   DD  0B86                         PUSHL   R6
                6445   DD  0B88                         PUSHL   (R4)[R5]
                6345   DD  0B8B                         PUSHL   (R3)[R5]
                  58   DD  0B8E                         PUSHL   R8
              FD5E CF  9F  0B90                         PUSHAB  T_XOR
     000100E0 9F  05   FB  0B94                         CALLS   #$$N, @#DS$PRINTB
                  13   11  0B9B   403        BRB        17$                           ; check if finished
                           0B9D   404 16$:   $DS_PRINTX_S       FORMAT=T_NOXOR,P0=R8,P1=(R3)[R5],P2=(R4)[R5]
                6445   DD  0B9D                         PUSHL   (R4)[R5]
                6345   DD  0BA0                         PUSHL   (R3)[R5]
                  58   DD  0BA3                         PUSHL   R8
              FD63 CF  9F  0BA5                         PUSHAB  T_NOXOR
     000100E8 9F  04   FB  0BA9                         CALLS   #$$N, @#DS$PRINTX
            C2 55 57   F3  0BB0   405 17$:   AOBLEQ     R7,R5,15$
      0B F483 CF  05   E1  0BB4   406 18$:   BBC        #V_TIMER,L_FLAGS,19$   ; br = no timer error
                           0BBA   407        $DS_PRINTB_S       FORMAT=T_TIMER
              FA74 CF  9F  0BBA                         PUSHAB  T_TIMER
```

```
        000100E0 9F    01    FB  0BBE                          CALLS    #$$N, @#DS$PRINTB
                                 0BC5    408 19$:
                                 0BC5    409         $DS_ENDMESSAGE
                             04  0BC5                          RET                          ; RETURN TO DIAGNOSTIC SUPERVISOR
                                 0BC6    410
```

```
                                  0BC6   412 .SBTTL  SUBROUTINES
                                  0BC6   413
                                  0BC6   414
                                  0BC6   415 ; This routine will clear the buffer area.
                                  0BC6   416
                                  0BC6   417 CLEAR_BUFFER:
         55   00000000'FF     DE  0BC6   418         MOVAL   @A_HALT_BUFFER,R5 ; get starting buffer address
                     F447 CF  D4  0BCD   419         CLRL    L_COUNT           ; initialize counter
                          85  D4  0BD1   420 1$:     CLRL    (R5)+             ; clear a buffer location
   F4 F43C CF   00000100 8F   F3  0BD3   421         AOBLEQ  #256,L_COUNT,1$ ; br = not finished
                              05  0BDD   422         RSB                       ; return
                                  0BDE   423
                                  0BDE   424 ; This routine will load general purpose registers R0 to R11 with data and
                                  0BDE   425 ; read the AP and FP befor a halt is tested.
                                  0BDE   426
                                  0BDE   427 LOAD_GPR:
         5B   00000000'EF     DE  0BDE   428         MOVAL   GPR_TABLE,R11     ; load address of data table to load GPR's
                    50   8B   7D  0BE5   429         MOVQ    (R11)+,R0         ; move data into R0 and R1
                    52   8B   7D  0BE8   430         MOVQ    (R11)+,R2         ; move data into R2 and R3
                    54   8B   7D  0BEB   431         MOVQ    (R11)+,R4         ; move data into R4 and R5
                    56   8B   7D  0BEE   432         MOVQ    (R11)+,R6         ; move data into R6 and R7
                    58   8B   7D  0BF1   433         MOVQ    (R11)+,R8         ; move data into R8 and R9
                    5A   8B   7D  0BF4   434         MOVQ    (R11)+,R10        ; move data into R10 and R11
        00000000'EF      5C   D0  0BF7   435         MOVL    AP,L_EXP_AP       ; move contents of AP into expected data table
        00000000'EF      5D   D0  0BFE   436         MOVL    FP,L_EXP_FP       ; move contents of FP into expected data table
                              05  0C05   437         RSB                       ; return
                                  0C06   438
                                  0C06   439 ; This routine will read general purpose registers R0 to R11 , the AP, FP, SP
                                  0C06   440 ; KSP, ISP and PSL into a buffer area (A_HALT_BUFFER) to check data patterns
                                  0C06   441 ; and data after a halt. It will then retrun to to address contained in
                                  0C06   442 ; RENTRY_POINT.
                                  0C06   443
                                  0C06   444 READ_GPR:
        00000000'FF      50   7D  0C06   445         MOVQ    R0,@A_HALT_BUFFER ; move contents of R0 and R1 into buffer
        50   00000000'EF      D0  0C0D   446         MOVL    A_HALT_BUFFER,R0 ; load R0 with address of buffer
                    50   08   C0  0C14   447         ADDL2   #8,R0             ; get over first two words
                    80   52   7D  0C17   448         MOVQ    R2,(R0)+          ; move contents of R2 and R3 into buffer
                    80   54   7D  0C1A   449         MOVQ    R4,(R0)+          ; move R4 and R5
                    80   56   7D  0C1D   450         MOVQ    R6,(R0)+          ; move R6 and R7
                    80   58   7D  0C20   451         MOVQ    R8,(R0)+          ; move R8 and R9
                    80   5A   7D  0C23   452         MOVQ    R10,(R0)+         ; move R10 and R11
                    80   5C   D0  0C26   453         MOVL    AP,(R0)+          ; move AP
                    80   5D   D0  0C29   454         MOVL    FP,(R0)+          ; move FP
        00000000'EF      5E   D0  0C2C   455         MOVL    SP,L_ACT_SP       ; move SP
 00000000'EF    00000000'8F   DB  0C33   456         MFPR    #PR$_KSP,L_ACT_KSP ; move KSP
 00000000'EF    00000000'8F   DB  0C3E   457         MFPR    #PR$_ISP,L_ACT_ISP ; move ISP
                00000000'EF   DC  0C49   458         MOVPSL  L_ACT_PSL         ; move PSL
                     F3B1 DF  17  0C4F   459         JMP     @RENTRY_POINT     ; return to subtest
                                  0C53   460
                                  0C53   461
                                  0C53   462 ; This routine will service unexpected interval timer interrupts and set an
                                  0C53   463 ; error flag.
                                  0C53   464
                                  0C53   465         .ALIGN  LONG
                                  0C54   466 TIMER_SERVICE:
             F3E3 CF     20   C8  0C54   467         BISL2   #M_TIMER,L_FLAGS ; set error flag
                              02  0C59   468         REI                       ; return
```

```
                                    0C5A  469
                                    0C5A  470
                                    0C5A  471 ; This routine will service unexpected CHANGE MODE exceptions and set
                                    0C5A  472 ; an error flag.
                                    0C5A  473
                                    0C5A  474           .ALIGN  LONG
                                    0C5C  475 CHMX_SERVICE:
              F3D3 DF     01    CA  0C5C  476           BICL2   #1,@L_TEMP              ; set service on inter. stack
              F3D6 CF     08    C8  0C61  477           BISL2   #M_CHMX_ERR,L_FLAGS ; set error flag
                          8E    D5  0C66  478           TSTL    (SP)+               ; get change mode argument off stack
                                02  0C68  479           REI                         ; return
                                    0C69  480
                                    0C69  481 ; This routine will service unexpected XFC exceptions and set a flag
                                    0C69  482 ; to indicate the error.
                                    0C69  483
                                    0C69  484           .ALIGN  LONG
                                    0C6C  485 XFC_ERROR:
              F3CB CF     10    C8  0C6C  486           BISL2   #M_XFC_ERR,L_FLAGS ; set error flag
                   6E     01    C0  0C71  487           ADDL2   #1,(SP)             ; update the pc for the REI
                                02  0C74  488           REI                         ; return
                                    0C75  489
                                    0C75  490 ; This routine will service expected XFC exceptions and set a flag to
                                    0C75  491 ; indicate successful completion of the operation.
                                    0C75  492
                                    0C75  493           .ALIGN  LONG
                                    0C78  494 XFC_SERVICE:
         F3BB CF    00000800 8F     C8  0C78  495           BISL2   #M_XFC,L_FLAGS  ; set flag
                   6E     01    C0  0C81  496           ADDL2   #1,(SP)             ; update the pc for the REI
                                02  0C84  497           REI                         ; return
                                    0C85  498
                                    0C85  499
                                    0C85  500 ; This routine is called after execution of an instruction which should cause
                                    0C85  501 ; a halt. The PSL, SP, KSP, ISP, GENERAL PURPOSE REGISTERS and FLAG BYTE are
                                    0C85  502 ; examined for expected information. If an error exists, a flag is set to
                                    0C85  503 ; indicate that it should be reported.
                                    0C85  504
                                    0C85  505 ERROR_CHECK::
                          57    D4  0C85  506           CLRL    R7                  ; initialize counter
                   55     0D    D0  0C87  507           MOVL    #13,R5              ; set limit
          53    00000000'EF     D0  0C8A  508           MOVL    A_HALT_BUFFER,R3 ; load address of actual data to check
          54    00000000'EF     DE  0C91  509           MOVAL   GPR_TABLE,R4        ; load address of expected data
                   84     83    D1  0C98  510 1$:       CMPL    (R3)+,(R4)+         ; check data
                          09    13  0C9B  511           BEQL    2$                  ; br = data is good
         F396 CF    00001400 8F     C8  0C9D  512           BISL2   #M_ERROR_FLAG!M_GPR_ERR,L_FLAGS ; set GPR and error flag
                   EE 57  55    F3  0CA6  513 2$:       AOBLEQ  R5,R7,1$            ; br = not finished
  00000000'EF   00000000'EF     D1  0CAA  514           CMPL    L_ACT_SP,L_EXP_SP ; check SP
                          09    13  0CB5  515           BEQL    3$                  ; br = SP is good
         F37C CF    00009000 8F     C8  0CB7  516           BISL2   #M_SP_ERR!M_ERROR_FLAG,L_FLAGS ; set SP and error flag
           1F 00000000'EF   1A      E1  0CC0  517 3$:       BBC     #PSL$V_IS,L_ACT_PSL,4$ ; br = on KS no possible error
         F36B CF    00010000 8F     C8  0CC8  518           BISL2   #M_ISTK,L_FLAGS ; set interrupt stack flag
  00000000'EF   00000000'EF     D1  0CD1  519           CMPL    L_ACT_KSP,L_EXP_KSP ; check KSP
                          09    13  0CDC  520           BEQL    4$                  ; br = KSP is good
         F355 CF    00003000 8F     C8  0CDE  521           BISL2   #M_KSP_ERR!M_ERROR_FLAG,L_FLAGS ; set KSP and error flag
           16 F350 CF     10    E0  0CE7  522 4$:       BBS     #V_ISTK,L_FLAGS,5$ ; br = on IS no possible error
  00000000'EF   00000000'EF     D1  0CED  523           CMPL    L_ACT_ISP,L_EXP_ISP ; check ISP
                          09    13  0CF8  524           BEQL    5$                  ; br = ISP is good
         F339 CF    00005000 8F     C8  0CFA  525           BISL2   #M_ISP_ERR!M_ERROR_FLAG,L_FLAGS ; set ISP and error flag
  00000000'EF   00000000'EF   D1  0D03   526 5$:    CMPL    L_ACT_PSL,L_EXP_PSL ; check PSL
                         42   13  0D0E   527                8$                  ; br = PSL is good
                   02    18   EF  0D10   528                EXTZV   #PSL$V_CURMOD,#PSL$S_CURMOD,-
       F309 CF  00000000'EF       0D13   529                L_EXP_PSL,L_EXP_MOD ; extract current mode from expected psl
                   02    18   ED  0D1B   530                CMPZV   #PSL$V_CURMOD,#PSL$S_CURMOD,-
       F2FE CF  00000000'EF       0D1E   531                L_ACT_PSL,L_EXP_MOD ; check current mode for error
                         18   12  0D26   532                BNEQ    6$                  ; br = wrong mode
                   01    1A   EF  0D28   533                EXTZV   #PSL$V_IS,#1,-
       F2F5 CF  00000000'EF       0D2B   534                L_EXP_PSL,L_EXP_STACK ; extract stack from expected PSL
                   01    1A   ED  0D33   535                CMPZV   #PSL$V_IS,#1,-
       F2EA CF  00000000'EF       0D36   536                L_ACT_PSL,L_EXP_STACK ; check current stack for error
                         09   13  0D3E   537                BEQL    7$                  ; br = mode is good
       F2F3 CF  00000100 8F   C8  0D40   538 6$:    BISL2   #M_FATAL_ERR,L_FLAGS ; signal fatal error
       F2EA CF  00001200 8F   C8  0D49   539 7$:    BISL2   #M_PSL_ERR!M_ERROR_FLAG,L_FLAGS ; set PSL and error flag
          09 F2E5 CF     00   E0  0D52   540 8$:    BBS     #V_READY,L_FLAGS,9$ ; br = no ready error
       F2DB CF  00001000 8F   C8  0D58   541                BISL2   #M_ERROR_FLAG,L_FLAGS ; set error flag
          09 F2D6 CF     02   E1  0D61   542 9$:    BBC     #V_EXECUTE_ERR,L_FLAGS,10$ ; br = no execute error
       F2CC CF  00001000 8F   C8  0D67   543                BISL2   #M_ERROR_FLAG,L_FLAGS ; set error flag
          09 F2C7 CF     01   E0  0D70   544 10$:   BBS     #V_DONE,L_FLAGS,11$ ; br = no done error
       F2BD CF  00001000 8F   C8  0D76   545                BISL2   #M_ERROR_FLAG,L_FLAGS ; set error flag
          09 F2B8 CF     03   E1  0D7F   546 11$:   BBC     #V_CHMX_ERR,L_FLAGS,12$ ; br = no unexpected CHMx exception
       F2AE CF  00001000 8F   C8  0D85   547                BISL2   #M_ERROR_FLAG,L_FLAGS ; set error flag
          09 F2A9 CF     04   E1  0D8E   548 12$:   BBC     #V_XFC_ERR,L_FLAGS,13$ ; br = no unexpected XFC exception
       F29F CF  00001000 8F   C8  0D94   549                BISL2   #M_ERROR_FLAG,L_FLAGS ; set error flag
          09 F29A CF     05   E1  0D9D   550 13$:   BBC     #V_TIMER,L_FLAGS,14$ ; br = no unexpected timer interrupt
       F290 CF  00001000 8F   C8  0DA3   551                BISL2   #M_ERROR_FLAG,L_FLAGS ; set error flag
                              05  0DAC   552 14$:   RSB                         ; return
                                  0DAD   553
                                  0DAD   554                $DS_PAGE
                         0DAD                  .SBTTL  TEST 3:  PROCESSOR HALTS ARCH. DEFINED
                     00000000                          .PSECT  TEST_003, PAGE, NOWRT
                         0020
                         0020     557 ;++
                         0020     558 ; Test description:
                         0020     559 ;
                         0020     560 ;          This test checks the various ways the VAX-11/730 processor can
                         0020     561 ;          be halted in an architecturally defined manner. This includes
                         0020     562 ;          executing a HALT instruction in kernel mode, attempting
                         0020     563 ;          certain references to an invalid interrupt stack and executing
                         0020     564 ;          change mode instructions when the IS bit of the PSL is set.
                         0020     565 ;
                         0020     566 ;          INSTRUCTIONS FOR EARLY ABORT:  If it is desired to exit the test
                         0020     567 ;          before completion, one must wait for the console prompt ( >>> )
                         0020     568 ;          after the halt occurs and type in the sequence D PC adr <CR>
                         0020     569 ;          C <CR>, where adr is the absolute address of the label
                         0020     570 ;          TEST_003_X:: in the program listing.
                         0020     571 ;
                         0020     572 ;--
                         0020     573
                         0020     574
                         0020     575          $DS_BGNTEST      <MANUAL,HALT,ALL>
                         0020           DATA_003:
            00000000     0020                  .LONG    0                    ; TEST ARGUMENT TABLE TERMINATOR
                         0024           TEST_003::
                0000     0024                  .WORD    ^M<>                 ; ENTRY MASK
                         0026     576
     00000000'EF    D5   0026     577          TSTL     KA_PTABLE            ; CPU selected?
              10    18   002C     578          BGEQ     5$                   ; br = CPU selected
                         002E     579          $DS_PRINTF_S     FORMAT=T_NO_KA730 ; print exit warning
     0000004D'EF    9F   002E                          PUSHAB  T_NO_KA730
  000100F0 9F  01   FB   0034                          CALLS   #$$N, @#DS$PRINTF
                         003B     580          $DS_EXIT         TEST                 ; exit test
            0B22    31   003B                  BRW              TEST_003_X           ; EXIT TEST 3
                         003E     581 ;
                         003E     582 ; Ask operator if Auto Restart Switch is in off position, continue if YES, exit
                         003E     583 ; test if NO.
                         003E     584 ;
                         003E     585 5$:      $DS_PRINTF_S     FORMAT=T_WARNING           ; print warning
     00000129'EF    9F   003E                          PUSHAB  T_WARNING
  000100F0 9F  01   FB   0044                          CALLS   #$$N, @#DS$PRINTF
                         004B     586
                         004B     587          $DS_ASKLGCL_S    MSGADR=T_REST_OFF,-        ; ask operator
                         004B     588                           DATADR=B_ANSWER,-          ; location of answer
                         004B     589                           YEXFER=7$,-                ; br to 7$ if YES
                         004B     590                           DEFALT=PAR$_NO             ; default is NO
              00    DD   004B                          PUSHL   #0
     00000000'EF    DD   004D                          PUSHL   PAR$_NO
              00    DD   0053                          PUSHL   #0
     00000080'EF    DF   0055                          PUSHAL  7$
              00    DD   005B                          PUSHL   #0
     00000000'EF    DF   005D                          PUSHAL  B_ANSWER
     00000191'EF    DF   0063                          PUSHAL  T_REST_OFF
  00010098 9F  07   FB   0069                          CALLS   #7, @#DS$ASKLGCL
                         0070     591
                         0070     592          $DS_PRINTF_S     FORMAT=T_EXITING           ; print warning
     00000114'EF    9F   0070                          PUSHAB  T_EXITING
```

```
             000100F0 9F    01    FB  0076                        CALLS   #$$N, @#DS$PRINTF
                                      007D   593         $DS_EXIT         TEST                    ; exit test if NO
                     0AE0    31       007D                        BRW     TEST_003_X              ; EXIT TEST 3
                                      0080   594
             00000000'EF    5E    D0  0080   595 7$:     MOVL     SP,L_KSP                        ; save initial KSP
   00000000'EF   00000000'8F      DB  0087   596         MFPR     #PR$_ISP,L_ISP                  ; save initial ISP
                 00000BC6'EF      16  0092   597         JSB      CLEAR_BUFFER                    ; clear buffer area
                                      0098   598         $DS_SETVEC_S     VECTOR=#SCB$L_TIMER, SRVADR=TIMER_SERVICE
                             00   DD  0098                        PUSHL   #0
                 00000C54'EF      DF  009A                        PUSHAL  TIMER_SERVICE
                 000000C0 8F      DD  00A0                        PUSHL   #SCB$L_TIMER
             00010160 9F    03    FB  00A6                        CALLS   #3, @#DS$SETVEC
                                      00AD   599 10$:
                                      00AD   600         $DS_PAGE
```

```
                                  00AD          .SBTTL  SUBTEST 3.1:  HALT Inst. in Kernel Mode
                                  00AD  603 ;+
                                  00AD  604 ; Subtest description:
                                  00AD  605 ;
                                  00AD  606 ;       This subtest checks that the HALT instruction halts the processor
                                  00AD  607 ;       when executed in kernel mode (code = 6).
                                  00AD  608 ;
                                  00AD  609 ;
                                  00AD  610 ; Subtest steps:
                                  00AD  611 ;
                                  00AD  612 ;       SUBTEST Halt Instruction in Kernel Mode
                                  00AD  613 ;       :  Initialize Flags
                                  00AD  614 ;       :  Setup code to set done flag at loc 100
                                  00AD  615 ;       :  Setup a jump to READ_GPR at next loc
                                  00AD  616 ;       :  Print instructions to operator
                                  00AD  617 ;       :  Load expected data for stacks
                                  00AD  618 ;       :  Load GPR's with data
                                  00AD  619 ;       :  Set ready to execute flag
                                  00AD  620 ;       :  Execute HALT
                                  00AD  621 ;       :  IF halt not executed properly
                                  00AD  622 ;       :  :  THEN
                                  00AD  623 ;       :  :  (will continue inline execution and get here)
                                  00AD  624 ;       :  :  Set halt execution error flag
                                  00AD  625 ;       :  ENDIF
                                  00AD  626 ;       :  Rentry point (restart will enter here)
                                  00AD  627 ;       :  Go check FLAGS, PSL, KSP, ISP, SP and GPR's for errors
                                  00AD  628 ;       :  IF any errors
                                  00AD  629 ;       :  :  THEN
                                  00AD  630 ;       :  :  Report errors
                                  00AD  631 ;       :  ENDIF
                                  00AD  632 ;       :  IF fatal error
                                  00AD  633 ;       :  :  THEN
                                  00AD  634 ;       :  :  Abort test
                                  00AD  635 ;       :  ENDIF
                                  00AD  636 ;       ENDSUBTEST Halt instruction in kernel mode
                                  00AD  637 ;
                                  00AD  638 ;-
                                  00AD  639
                                  00AD  640         $DS_BGNSUB
                                  00AD      T3_S1::
00010030 9F   00000000'EF    FA   00AD                      CALLG   $S$, @#DS$BGNSUB
              00000BC6'EF    16   00B8  641         JSB     CLEAR_BUFFER            ; clear data buffers
              0000003C'EF    D4   00BE  642         CLRL    L_FLAGS                 ; initialize flags
00000100'EF   00000040'EF    7D   00C4  643         MOVQ    JUMP,RESTART            ; load loc 100 with rentry code
00000108'EF   00000048'EF    7D   00CF  644         MOVQ    JUMP+8,RESTART+8        ; load rest of rentry code
00000004'EF   00000143'EF    DE   00DA  645         MOVAL   RENTRY1,RENTRY_POINT    ; load rentry address
                                  00E5  646         $DS_PRINTF_S    FORMAT=T_INSTRUCTIONS, P0=#CODE_06,P1=#4$
              0000013C'8F    DD   00E5                  PUSHL   #4$
                       06    DD   00EB                  PUSHL   #CODE_06
              00000085'EF    9F   00ED                  PUSHAB  T_INSTRUCTIONS
          000100F0 9F   03   FB   00F3                  CALLS   #$$N, @#DS$PRINTF
                                  00FA  647         $DS_PRINTF_S    FORMAT=T_CONTINUE
              000000C3'EF    9F   00FA                  PUSHAB  T_CONTINUE
          000100F0 9F   01   FB   0100                  CALLS   #$$N, @#DS$PRINTF
00000000'EF   00000000'EF    D0   0107  648         MOVL    L_KSP,L_EXP_SP          ; load expected SP
              00000000'EF    D4   0112  649         CLRL    L_EXP_KSP               ; KSP unpredictable if on kernel stack
00000000'EF   00000000'EF    D0   0118  650         MOVL    L_ISP,L_EXP_ISP         ; load expected ISP
```

```
 00000000'EF   0000095D'EF  D0  0123   651           MOVL    DATA_1,L_EXP_PSL            ; load expected PSL
               00000BDE'EF  16  012E   652           JSB     LOAD_GPR                    ; load GPR data and read AP & FP
      0000003C'EF    01     C8  0134   653           BISL2   #M_READY,L_FLAGS            ; set ready to execute flag
                     00         013B   654           HALT                                ; execute HALT instruction (should
                                013C   655                                               ; halt and continue at rentry point)
      0000003C'EF    04     C8  013C   656 4$:       BISL2   #M_EXECUTE_ERR,L_FLAGS      ; halt not executed, set error flag
                                0143   657 RENTRY1:                                      ; rentry point after executing halt
      5E  00000000'EF       D0  0143   658           MOVL    L_KSP,SP                    ; reset SP
               00000C85'EF  16  014A   659           JSB     ERROR_CHECK                 ; check for errors
   27 0000003C'EF    0C     E1  0150   660           BBC     #V_ERROR_FLAG,L_FLAGS,5$ ; br = no errors
                                0158   661           $DS_ERRHARD_S   UNIT =KA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_HALT_ERR
               000001F1'8F  DD  0158                         PUSHL   #T_HALT_ERR
               00000969'EF  DF  015E                         PUSHAL  ERR_MESSAGE
                        00  DD  0164                         PUSHL   #0
               00000000'EF  DD  0166                         PUSHL   KA_UNIT_NO
                        01  DD  016C                         PUSHL   #$ER
                                016E           ;;; TEST 3, SUBTEST 1, ERROR 1
      000100D0 9F    05     FB  016E                         CALLS   #$$M, @#DS$ERRHARD
                                0175   662           $DS_BCOMPLETE   5$
                  07 50     E8  0175                         BLBS    R0, 5$
                                0178   663           $DS_ABORT
      00010020 9F    6C     FA  0178                         CALLG   (AP), @#DS$ABORT
   07 0000003C'EF    08     E1  017F   664 5$:       BBC     #V_FATAL_ERR,L_FLAGS,6$ ; br = no fatal errors
                                0187   665           $DS_ABORT
      00010020 9F    6C     FA  0187                         CALLG   (AP), @#DS$ABORT
                                018E   666 6$:       $DS_ENDSUB
                                018E           T3_S1_X:
 00010038 9F   00000000'EF  FA  018E                         CALLG   $S$, @#DS$ENDSUB
                                0199   667           $DS_PAGE
```

```
0199                .SBTTL  SUBTEST 3.2:  Interrupt Stack invalid
0199          ;+
0199          ; Subtest description:
0199          ;
0199          ;         This subtest checks that an interrupt stack which is located on
0199          ;         a page which is protected to kernel read only, will halt the processor
0199          ;         when a write is attempted. An XFC instruction is executed to get onto
0199          ;         the interrupt stack prior to invalidating the interrupt stack pointer.
0199          ;         A second XFC instruction is executed with the vector specifying the
0199          ;         interrupt stack for service. When the XFC instruction is executed
0199          ;         there is an attempt to write the PC and PSL on the interrupt stack.
0199          ;         When this happens an ''Interrupt Stack not valid HALT'' should occur
0199          ;         (halt code = 4). Memory management is on for this subtest.
0199          ;
0199          ; Subtest steps:
0199          ;
0199          ;         SUBTEST Interrupt Stack invalid
0199          ;         :  Initialize Flags
0199          ;         :  Turn memory management on
0199          ;         :  Set page0 protection to kernel write access
0199          ;         :  IF unsucessful
0199          ;         :  :  THEN
0199          ;         :  :  Report system error
0199          ;         :  :  Abort program
0199          ;         :  ENDIF
0199          ;         :  Get XFC vector to handle on interrupt stack
0199          ;         :  Execute XFC instruction
0199          ;         :  IF not on the interrupt stack
0199          ;         :  :  THEN
0199          ;         :  :  Report system error
0199          ;         :  :  Abort program
0199          ;         :  ENDIF
0199          ;         :  Release XFC vector
0199          ;         :  Get XFC vector to handle on interrupt stack
0199          ;         :  Setup code to set done flag at loc 100
0199          ;         :  Setup a jump to READ_GPR at next loc
0199          ;         :  Save current IS SP to reset after subtest is complete
0199          ;         :  Set interrupt stack pointer to buffer area
0199          ;         :  Invalidate buffer page (kernel read only access)
0199          ;         :  IF unsucessful
0199          ;         :  :  THEN
0199          ;         :  :  Report system error
0199          ;         :  :  Abort program
0199          ;         :  ENDIF
0199          ;         :  Print instructions to operator
0199          ;         :  Setup all expected data
0199          ;         :  Load GPR's with data
0199          ;         :  Set ready to execute flag
0199          ;         :  Execute XFC to attempt to write PC and PSL on IS
0199          ;         :  (this should cause an interrupt stack not valid HALT)
0199          ;         :  IF XFC not executed properly
0199          ;         :  :  THEN
0199          ;         :  :  (will continue in line execution and get here)
0199          ;         :  :  Set XFC execution error flag
0199          ;         :  ENDIF
0199          ;         :  Rentry point (restart will enter here)
0199          ;         :  Read  PSL
```

```
                                0199   726 ;       : IF on IS as expected
                                0199   727 ;       : : THEN
                                0199   728 ;       : : Restore IS SP
                                0199   729 ;       : ENDIF
                                0199   730 ;       : Go check FLAGS, PSL, KSP, ISP, SP and GPR'S for errors
                                0199   731 ;       :  (Either the KSP or ISP will be UNPREDICTABLE depending on the
                                0199   732 ;       :  current stack, this is machine dependant)
                                0199   733 ;       : IF any errors
                                0199   734 ;       : : THEN
                                0199   735 ;       : : Report errors
                                0199   736 ;       : ENDIF
                                0199   737 ;       : IF fatal error
                                0199   738 ;       : : THEN
                                0199   739 ;       : : Abort program
                                0199   740 ;       : ENDIF
                                0199   741 ;       : Reset protection on buffer page to original protection
                                0199   742 ;       : Turn memory management off
                                0199   743 ;       : Release XFC vector
                                0199   744 ;       ENDSUBTEST Interrupt Stack invalid
                                0199   745 ;
                                0199   746 ;-
                                0199   747
                                0199   748         $DS_BGNSUB
                                0199       T3_S2::
00010030 9F   0000000C'EF   FA  0199                       CALLG   $S$, @#DS$BGNSUB
              00000BC6'EF   16  01A4   749         JSB     CLEAR_BUFFER            ; clear data buffers
              0000003C'EF   D4  01AA   750         CLRL    L_FLAGS                 ; initialize flags
              00000010'EF   D4  01B0   751         CLRL    L_PAGEZERO              ; set page zero to 0
                                01B6   752         $DS_MMON_S                      ; turn memory management on
00010150 9F            00   FB  01B6                       CALLS   #0, @#DS$MMON
                                01BD   753         $SETPRT_S       INADR=L_PAGEZERO,PROT=#PRT$C_KW
                       00   DD  01BD                       PUSHL   #0
              00000000'8F   DD  01BF                       PUSHL   #PRT$C_KW
                       00   DD  01C5                       PUSHL   #0
                       00   DD  01C7                       PUSHL   #0
              00000010'EF   7F  01C9                       PUSHAQ  L_PAGEZERO
00010430'GF            05   FB  01CF                       CALLS   #5,G^SYS$SETPRT
                                01D6   754         $DS_BCOMPLETE   1$
                    1A 50   E8  01D6                       BLBS    R0, 1$
                                01D9   755         $DS_ERRSYS_S    UNIT=#0,MSGADR=T_PAGE0PROT
                       00   DD  01D9                       PUSHL   #0
              000007B7'EF   DF  01DB                       PUSHAL  T_PAGE0PROT
                       00   DD  01E1                       PUSHL   #0
                       01   DD  01E3                       PUSHL   #$ER
                                01E5       ;;; TEST 3, SUBTEST 2, ERROR 1
000100C0 9F            04   FB  01E5                       CALLS   #$$M, @#DS$ERRSYS
                                01EC   756         $DS_ABORT
00010020 9F            6C   FA  01EC                       CALLG   (AP), @#DS$ABORT
                                01F3   757 1$:     $DS_SETVEC_S    VECTOR=#SCB$L_OPCCUS,SRVADR=RENTRY2,CODE=#1
                       01   DD  01F3                       PUSHL   #1
              00000208'EF   DF  01F5                       PUSHAL  RENTRY2
                       14   DD  01FB                       PUSHL   #SCB$L_OPCCUS
00010160 9F            03   FB  01FD                       CALLS   #3, @#DS$SETVEC
                            FC  0204   758 2$:     XFC
                                0205   759         .ALIGN  LONG
                                0208   760 RENTRY2:
              00000000'EF   DC  0208   761         MOVPSL  L_ACT_PSL
```

```
           1E 00000000'EF   1A   E0  020E   762         BBS     #PSL$V_IS,L_ACT_PSL,3$
                                     0216   763         $DS_ERRHARD_S   UNIT=KA_UNIT_NO, MSGADR=T_NOT_ON_IS
                            00   DD  0216                       PUSHL   #0
              0000083C'EF   DF  0218                       PUSHAL  T_NOT_ON_IS
              00000000'EF   DD  021E                       PUSHL   KA_UNIT_NO
                            02   DD  0224                       PUSHL   #$ER
                                     0226     ;;; TEST 3, SUBTEST 2, ERROR 2
              000100D0 9F   04   FB  0226                       CALLS   #$$M, @#DS$ERRHARD
                                     022D   764         $DS_ABORT
              00010020 9F   6C   FA  022D                       CALLG   (AP), @#DS$ABORT
                                     0234   765 3$:     $DS_CLRVEC_S    VECTOR=#SCB$L_OPCCUS
                            14   DD  0234                       PUSHL   #SCB$L_OPCCUS
              00010168 9F   01   FB  0236                       CALLS   #1, @#DS$CLRVEC
                                     023D   766         $DS_SETVEC_S    VECTOR=#SCB$L_OPCCUS,SRVADR=XFC_SERVICE,CODE=#1
                            01   DD  023D                       PUSHL   #1
              00000C78'EF   DF  023F                       PUSHAL  XFC_SERVICE
                            14   DD  0245                       PUSHL   #SCB$L_OPCCUS
              00010160 9F   03   FB  0247                       CALLS   #3, @#DS$SETVEC
00000100'EF   00000040'EF   7D  024E   767 4$:     MOVQ    JUMP,RESTART             ; setup code to renter after halt
00000108'EF   00000048'EF   7D  0259   768         MOVQ    JUMP+8,RESTART+8         ; load rest of rentry code
00000004'EF   00000343'EF   DE  0264   769         MOVAL   RENTRY3,RENTRY_POINT     ; load rentry address
              00000020'EF   5E   D0  026F   770         MOVL    SP,L_CUR_ISP             ; read the current IS SP
                                     0276   771 5$:     $DS_PRINTF_S    FORMAT=T_INSTRUCTIONS,P0=#CODE_04,P1=#8$
              0000033B'8F   DD  0276                       PUSHL   #8$
                            04   DD  027C                       PUSHL   #CODE_04
              00000085'EF   9F  027E                       PUSHAB  T_INSTRUCTIONS
              000100F0 9F   03   FB  0284                       CALLS   #$$N, @#DS$PRINTF
                                     028B   772         $DS_PRINTF_S    FORMAT=T_CONTINUE
              000000C3'EF   9F  028B                       PUSHAB  T_CONTINUE
              000100F0 9F   01   FB  0291                       CALLS   #$$N, @#DS$PRINTF
0000001C'EF   00000000'EF   D0  0298   773 6$:     MOVL    A_BUFFER_BEGIN,L_ADDRESS ; get starting address of buffer
00000008'EF   0000001C'EF   D0  02A3   774         MOVL    L_ADDRESS,L_PAGESTRT     ; load address of page to change
0000000C'EF   0000001C'EF   D0  02AE   775         MOVL    L_ADDRESS,L_PAGEND       ; protection in 2 longword array
              0000001C'EF   28   C0  02B9   776         ADDL2   #40,L_ADDRESS            ; point into protected page
                                     02C0   777         $SETPRT_S INADR=L_PAGESTRT,PROT=#PRT$C_KR,PRVPRT=L_OLDPROT
              0000002C'EF   DF  02C0                       PUSHAL  L_OLDPROT
              00000000'8F   DD  02C6                       PUSHL   #PRT$C_KR
                            00   DD  02CC                       PUSHL   #0
                            00   DD  02CE                       PUSHL   #0
              00000008'EF   7F  02D0                       PUSHAQ  L_PAGESTRT
              00010430'GF   05   FB  02D6                       CALLS   #5,G^SYS$SETPRT
                                     02DD   778         $DS_BCOMPLETE   7$
                         1E 50   E8  02DD                       BLBS    R0, 7$
                                     02E0   779         $DS_ERRSYS_S    UNIT=KA_UNIT_NO, MSGADR=T_PAGEPROT
                            00   DD  02E0                       PUSHL   #0
              000007E5'EF   DF  02E2                       PUSHAL  T_PAGEPROT
              00000000'EF   DD  02E8                       PUSHL   KA_UNIT_NO
                            03   DD  02EE                       PUSHL   #$ER
                                     02F0     ;;; TEST 3, SUBTEST 2, ERROR 3
              000100C0 9F   04   FB  02F0                       CALLS   #$$M, @#DS$ERRSYS
                                     02F7   780         $DS_ABORT
              00010020 9F   6C   FA  02F7                       CALLG   (AP), @#DS$ABORT
                                     02FE   781
00000000'EF   0000001C'EF   04   C3  02FE   782 7$:     SUBL3   #4,L_ADDRESS,L_EXP_SP    ; load expected SP
00000000'EF   00000000'EF   D0  030A   783         MOVL    L_KSP,L_EXP_KSP          ; load expected KSP
              00000000'EF   D4  0315   784         CLRL    L_EXP_ISP                ; ISP unpredictable if on int. stack
00000000'EF   00000961'EF   D0  031B   785         MOVL    DATA_2,L_EXP_PSL         ; load expected PSL
```

```
                                  0326   786
            00000BDE'EF     16    0326   787         JSB     LOAD_GPR                  ; load GPR's with data and read AP, FP
     0000003C'EF     01     C8    032C   788         BISL2   #M_READY,L_FLAGS          ; set ready to execute flag
     5E    0000001C'EF      D0    0333   789         MOVL    L_ADDRESS,SP              ; point IS SP to that address
                            01    033A   790         NOP                               ; wait a little
                            FC    033B   791 8$:     XFC                               ; execute XFC instruction to cause
                                  033C   792                                           ; exception which will attempt to push
                                  033C   793                                           ; on an invalid IS, renter at RENTRY2
                                  033C   794
     0000003C'EF     04     C8    033C   795         BISL2   #M_EXECUTE_ERR,L_FLAGS    ; set flag, XFC did not work properly
                                  0343   796
                                  0343   797 RENTRY3:
                                  0343   798
  11 00000000'EF     1A     E1    0343   799         BBC     #PSL$V_IS,L_ACT_PSL,10$   ; br = not on IS as expected
     5E    00000020'EF      D0    034B   800         MOVL    L_CUR_ISP,SP              ; reset IS SP
     6E    0000035A'8F      D0    0352   801         MOVL    #9$,(SP)                  ; setup return address
                            02    0359   802         REI                               ; get off interrupt stack
                     0B     11    035A   803 9$:     BRB     11$                       ; skip IPR load
00000000'8F  00000020'EF    DA    035C   804 10$:    MTPR    L_CUR_ISP,#PR$_ISP        ; load IS SP into IPR
            00000C85'EF     16    0367   805 11$:    JSB     ERROR_CHECK               ; check for errors (GPR's,AP,FP,PSL)
  24 0000003C'EF     0C     E1    036D   806         BBC     #V_ERROR_FLAG,L_FLAGS,12$ ; br = no errors
                                  0375   807         $DS_ERRHARD_S   UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_INVLDIS_ERR
            00000215'8F     DD    0375                       PUSHL   #T_INVLDIS_ERR
            00000969'EF     DF    037B                       PUSHAL  ERR_MESSAGE
                     00     DD    0381                       PUSHL   #0
            00000000'EF     DD    0383                       PUSHL   KA_UNIT_NO
                     04     DD    0389                       PUSHL   #$ER
                                  038B           ;;; TEST 3, SUBTEST 2, ERROR 4
     000100D0 9F     05     FB    038B                       CALLS   #$$M, @#DS$ERRHARD
                                  0392   808         $DS_ABORT
     00010020 9F     6C     FA    0392                       CALLG   (AP), @#DS$ABORT
  07 0000003C'EF     08     E1    0399   809 12$:    BBC     #V_FATAL_ERR,L_FLAGS,13$ ; br = no fatal errors
                                  03A1   810         $DS_ABORT
     00010020 9F     6C     FA    03A1                       CALLG   (AP), @#DS$ABORT
                                  03A8   811 13$:    $SETPRT_S INADR=L_PAGESTRT,PROT=#PRT$C_KW,PRVPRT=L_OLDPROT
            0000002C'EF     DF    03A8                       PUSHAL  L_OLDPROT
            00000000'8F     DD    03AE                       PUSHL   #PRT$C_KW
                     00     DD    03B4                       PUSHL   #0
                     00     DD    03B6                       PUSHL   #0
            00000008'EF     7F    03B8                       PUSHAQ  L_PAGESTRT
     00010430'GF     05     FB    03BE                       CALLS   #5,G^SYS$SETPRT
                                  03C5   812         $DS_BCOMPLETE   14$
               1E 50        E8    03C5                       BLBS    R0, 14$
                                  03C8   813         $DS_ERRSYS_S    UNIT=KA_UNIT_NO, MSGADR=T_PAGEPROT
                     00     DD    03C8                       PUSHL   #0
            000007E5'EF     DF    03CA                       PUSHAL  T_PAGEPROT
            00000000'EF     DD    03D0                       PUSHL   KA_UNIT_NO
                     05     DD    03D6                       PUSHL   #$ER
                                  03D8           ;;; TEST 3, SUBTEST 2, ERROR 5
     000100C0 9F     04     FB    03D8                       CALLS   #$$M, @#DS$ERRSYS
                                  03DF   814         $DS_ABORT
     00010020 9F     6C     FA    03DF                       CALLG   (AP), @#DS$ABORT
                                  03E6   815 14$:    $DS_MMOFF_S                       ; turn memory management off
     00010158 9F     00     FB    03E6                       CALLS   #0, @#DS$MMOFF
                                  03ED   816         $DS_CLRVEC_S    VECTOR=#SCB$L_OPCCUS
                     14     DD    03ED                       PUSHL   #SCB$L_OPCCUS
     00010168 9F     01     FB    03EF                       CALLS   #1, @#DS$CLRVEC
```

```
                                 03F6   817          $DS_ENDSUB
                                 03F6         T3_S2_X:
    00010038 9F    0000000C'EF   FA  03F6                    CALLG   $S$, @#DS$ENDSUB
                                 0401   818          $DS_PAGE
```

```
0401              .SBTTL  SUBTEST 3.3:  IS SP points to NXM
0401        ;+
0401        ; Subtest description:
0401        ;
0401        ;         This subtest checks that an interrupt stack, stack pointer which
0401        ;         points to nonexistent memory will halt the processor. Memory
0401        ;         management is off for this subtest and an Interrupt Stack not valid
0401        ;         HALT should occur (code = 4).
0401        ;
0401        ; Subtest steps:
0401        ;
0401        ;         SUBTEST IS points to NXM
0401        ;         :  Initialize Flags
0401        ;         :  Setup code to set done flag at loc 100
0401        ;         :  Save current IS SP
0401        ;         :  Setup a jump to RENTRY point at next loc
0401        ;         :  Get XFC vector to handle on interrupt stack
0401        ;         :  Execute XFC instruction
0401        ;         :  IF not on the interrupt stack
0401        ;         :  :  THEN
0401        ;         :  :  Report system error
0401        ;         :  :  Abort program
0401        ;         :  ENDIF
0401        ;         :  Release XFC vector
0401        ;         :  Get XFC vector for service on the interrupt stack
0401        ;         :  Print instructions to operator
0401        ;         :  Point interrupt stack pointer to NXM
0401        ;         :  Setup all expected data
0401        ;         :  Load GPR's with data
0401        ;         :  Set ready to execute flag
0401        ;         :  Execute XFC which will write PC and PSL on IS
0401        ;         :  (this should cause an interrupt stack not valid HALT)
0401        ;         :  IF XFC not executed (will continue and get here)
0401        ;         :  :  THEN
0401        ;         :  :  Set XFC execution error flag
0401        ;         :  ENDIF
0401        ;         :  RENTRY point (restart will enter here)
0401        ;         :  Read PSL
0401        ;         :  IF on IS stack as expected
0401        ;         :  :  THEN
0401        ;         :  :  Restore IS SP
0401        ;         :  ENDIF
0401        ;         :  Go check FLAGS, PSL, KSP, ISP, SP and GPR's for errors
0401        ;         :  IF any errors
0401        ;         :  :  THEN
0401        ;         :  :  Report errors
0401        ;         :  ENDIF
0401        ;         :  IF fatal error
0401        ;         :  :  THEN
0401        ;         :  :  Abort test
0401        ;         :  ENDIF
0401        ;         :  Release XFC vector
0401        ;         ENDSUBTEST IS points to NXM
0401        ;
0401        ;-
0401
0401              $DS_BGNSUB
```

```
                                        0401        T3_S3::
       00010030 9F   00000018'EF   FA   0401                         CALLG    $S$, @#DS$BGNSUB
                     00000BC6'EF   16   040C    877        JSB       CLEAR_BUFFER              ; clear data buffers
                     0000003C'EF   D4   0412    878        CLRL      L_FLAGS                   ; initialize flags
                                        0418    879        $DS_MMON_S
            00010150 9F   00       FB   0418                         CALLS    #0, @#DS$MMON
                                        041F    880        $DS_SETVEC_S       VECTOR=#SCB$L_OPCCUS,SRVADR=RENTRY4,CODE=#1
                          01       DD   041F                         PUSHL    #1
                     00000434'EF   DF   0421                         PUSHAL   RENTRY4
                          14       DD   0427                         PUSHL    #SCB$L_OPCCUS
            00010160 9F   03       FB   0429                         CALLS    #3, @#DS$SETVEC
                                   FC   0430    881 1$:    XFC                                 ; get onto the IS
                                        0431    882        .ALIGN    LONG
                                        0434    883 RENTRY4:
                     00000000'EF   DC   0434    884        MOVPSL    L_ACT_PSL
         1E 00000000'EF   1A       E0   043A    885        BBS       #PSL$V_IS,L_ACT_PSL,2$
                                        0442    886        $DS_ERRHARD_S      UNIT=KA_UNIT_NO, MSGADR=T_NOT_ON_IS
                          00       DD   0442                         PUSHL    #0
                     0000083C'EF   DF   0444                         PUSHAL   T_NOT_ON_IS
                     00000000'EF   DD   044A                         PUSHL    KA_UNIT_NO
                          01       DD   0450                         PUSHL    #$ER
                                        0452        ;;; TEST 3, SUBTEST 3, ERROR 1
            000100D0 9F   04       FB   0452                         CALLS    #$$M, @#DS$ERRHARD
                                        0459    887        $DS_ABORT
            00010020 9F   6C       FA   0459                         CALLG    (AP), @#DS$ABORT
                                        0460    888 2$:    $DS_CLRVEC_S       VECTOR=#SCB$L_OPCCUS
                          14       DD   0460                         PUSHL    #SCB$L_OPCCUS
            00010168 9F   01       FB   0462                         CALLS    #1, @#DS$CLRVEC
                                        0469    889
                                        0469    890        $DS_SETVEC_S       VECTOR=#SCB$L_OPCCUS,SRVADR=XFC_SERVICE,CODE=#1
                          01       DD   0469                         PUSHL    #1
                     00000C78'EF   DF   046B                         PUSHAL   XFC_SERVICE
                          14       DD   0471                         PUSHL    #SCB$L_OPCCUS
            00010160 9F   03       FB   0473                         CALLS    #3, @#DS$SETVEC
 00000100'EF         00000040'EF   7D   047A    891 3$:    MOVQ      JUMP,RESTART              ; setup code to renter after halt
 00000108'EF         00000048'EF   7D   0485    892        MOVQ      JUMP+8,RESTART+8          ; load rest of rentry code
 00000004'EF         00000508'EF   DE   0490    893        MOVAL     RENTRY5,RENTRY_POINT      ; load rentry address
                     00000020'EF   5E   D0   049B    894        MOVL      SP,L_CUR_ISP              ; read the current IS SP
                                        04A2    895 4$:    $DS_PRINTF_S       FORMAT=T_INSTRUCTIONS,P0=#CODE_04,P1=#6$
                     00000500'8F   DD   04A2                         PUSHL    #6$
                          04       DD   04A8                         PUSHL    #CODE_04
                     00000085'EF   9F   04AA                         PUSHAB   T_INSTRUCTIONS
            000100F0 9F   03       FB   04B0                         CALLS    #$$N, @#DS$PRINTF
                                        04B7    896        $DS_PRINTF_S       FORMAT=T_CONTINUE
                     000000C3'EF   9F   04B7                         PUSHAB   T_CONTINUE
            000100F0 9F   01       FB   04BD                         CALLS    #$$N, @#DS$PRINTF
 00000000'EF         FFFFFFF8 8F   D0   04C4    897 5$:    MOVL      #-8,L_EXP_SP              ; load expected SP
 00000000'EF         00000000'EF   D0   04CF    898        MOVL      L_KSP,L_EXP_KSP           ; load expected KSP
                     00000000'EF   D4   04DA    899        CLRL      L_EXP_ISP                 ; ISP unpredictable if on int. stack
 00000000'EF         00000965'EF   D0   04E0    900        MOVL      DATA_3,L_EXP_PSL          ; load expected PSL
                     00000BDE'EF   16   04EB    901        JSB       LOAD_GPR                  ; load GPR'S and read AP & FP
          5E         FFFFFFFC 8F   D0   04F1    902        MOVL      #-4,SP                    ; point IS sp to a NXM address
         0000003C'EF      01       C8   04F8    903        BISL2     #M_READY,L_FLAGS          ; set ready to execute flag
                                   01   04FF    904        NOP                                 ; wait a little
                                   FC   0500    905 6$:    XFC                                 ; execute XFC instruction to cause
                                        0501    906                                            ; exception which will push on IS
                                        0501    907                                            ; and cause a not valid halt
         0000003C'EF     04    C8  0501     908            BISL2   #M_EXECUTE_ERR,L_FLAGS  ; if no exception occurs will get here
                                   0508     909
                                   0508     910 RENTRY5:                                ; will renter here when completed
                                   0508     911
      11 00000000'EF     1A    E1  0508     912            BBC     #PSL$V_IS,L_ACT_PSL,8$  ; br = not on IS as expected
         5E    00000020'EF     D0  0510     913            MOVL    L_CUR_ISP,SP            ; reset IS SP
         6E    0000051F'8F     D0  0517     914            MOVL    #7$,(SP)                ; setup return address
                               02  051E     915            REI                             ; get off interrupt stack
                         0B    11  051F     916 7$:        BRB     9$                      ; skip IPR load
00000000'8F    00000020'EF     DA  0521     917 8$:        MTPR    L_CUR_ISP,#PR$_ISP      ; load IS SP into IPR
                                   052C     918
         00000C85'EF     16        052C     919 9$:        JSB     ERROR_CHECK             ; check for errors (GPR's,AP,FP,PSL)
      2C 0000003C'EF     0C    E1  0532     920            BBC     #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                   053A     921            $DS_ERRHARD_S   UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_NXMIS_ERR
         00000250'8F           DD  053A                            PUSHL   #T_NXMIS_ERR
         00000969'EF           DF  0540                            PUSHAL  ERR_MESSAGE
                 00            DD  0546                            PUSHL   #0
         00000000'EF           DD  0548                            PUSHL   KA_UNIT_NO
                 02            DD  054E                            PUSHL   #$ER
                                   0550        ;;; TEST 3, SUBTEST 3, ERROR 2
         000100D0 9F     05    FB  0550                            CALLS   #$$M, @#DS$ERRHARD
      07 0000003C'EF     08    E1  0557     922            BBC     #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                   055F     923            $DS_ABORT
         00010020 9F     6C    FA  055F                            CALLG   (AP), @#DS$ABORT
                                   0566     924 10$:       $DS_MMOFF_S                     ; turn memory management off
         00010158 9F     00    FB  0566                            CALLS   #0, @#DS$MMOFF
                                   056D     925            $DS_CLRVEC_S    VECTOR=#SCB$L_OPCCUS
                 14            DD  056D                            PUSHL   #SCB$L_OPCCUS
         00010168 9F     01    FB  056F                            CALLS   #1, @#DS$CLRVEC
                                   0576     926            $DS_ENDSUB
                                   0576                T3_S3_X:
00010038 9F    00000018'EF     FA  0576                            CALLG   $S$, @#DS$ENDSUB
                                   0581     927            $DS_PAGE
```

```
0581             .SBTTL  SUBTEST 3.4:  CHMU inst. with PSL<IS>=1
0581     ;+
0581     ; Subtest description:
0581     ;
0581     ;       This subtest checks that a CHMU instruction with PSL<IS>=1, will cause
0581     ;       the processor to HALT (code = A).
0581     ;
0581     ; Subtest steps:
0581     ;
0581     ;       SUBTEST CHMU instruction with PSL<IS>=1
0581     ;       :  Initialize Flags
0581     ;       :  Get XFC vector to handle exception on interrupt stack
0581     ;       :  Get CHMU vector in case CHMU instruction does execute
0581     ;       :  Setup code to set done flag at loc 100
0581     ;       :  Setup code to jump to READ_GPR point in next loc
0581     ;       :  Print restart instructions to operator
0581     ;       :  Execute an XFC instruction to get on interrupt stack
0581     ;       :  Read current PSL
0581     ;       :  IF NOT on interrupt stack
0581     ;       :  :  THEN
0581     ;       :  :  Report wrong stack error
0581     ;       :  :  Abort test
0581     ;       :  ENDIF
0581     ;       :  Setup all expected data
0581     ;       :  Load GPR's with data
0581     ;       :  Set ready to execute flag
0581     ;       :  Execute CHMU to cause processor to HALT
0581     ;       :  (this should cause a CHMU on interrupt stack HALT)
0581     ;       :  IF CHMU does not caues an exception
0581     ;       :  :  THEN
0581     ;       :  :  Set execution error flag
0581     ;       :  ENDIF
0581     ;       :  RENTRY point (restart enters here from exception)
0581     ;       :  Go check FLAGS, PSL, KSP, ISP, SP and GPR's for errors
0581     ;       :  IF any errors
0581     ;       :  :  THEN
0581     ;       :  :  Report errors
0581     ;       :  ENDIF
0581     ;       :  IF fatal error
0581     ;       :  :  THEN
0581     ;       :  :  Abort test
0581     ;       :  ENDIF
0581     ;       :  Modify PC on stack to point to second RENTRY point
0581     ;       :  Execute REI to get back to correct stack
0581     ;       :  Second RENTRY point
0581     ;       :  Read PSL
0581     ;       :  IF not on kernel stack
0581     ;       :  :  THEN
0581     ;       :  :  Report incorrect stack error
0581     ;       :  :  Abort test
0581     ;       :  ENDIF
0581     ;       :  Release interval timer vector
0581     ;       :  Release CHMU vector
0581     ;       :  Release XFC vector
0581     ;       ENDSUBTEST CHMU instruction with PSL<IS>=1
0581     ;
0581     ;-
```

```
                                       0581  986
                                       0581  987         $DS_BGNSUB
                                       0581      T3_S4::
     00010030 9F   00000024'EF      FA 0581                      CALLG   $S$, @#DS$BGNSUB
                   00000BC6'EF      16 058C  988         JSB     CLEAR_BUFFER            ; clear data buffers
                   0000003C'EF      D4 0592  989         CLRL    L_FLAGS                 ; initialize flags
                                       0598  990         $DS_SETVEC_S    VECTOR=#SCB$L_OPCCUS,SRVADR=RENTRY6,CODE=#1
                            01      DD 0598                      PUSHL   #1
                   000005C0'EF      DF 059A                      PUSHAL  RENTRY6
                            14      DD 05A0                      PUSHL   #SCB$L_OPCCUS
              00010160 9F   03      FB 05A2                      CALLS   #3, @#DS$SETVEC
                                       05A9  991 1$:     $DS_SETVEC_S    VECTOR=#SCB$L_CHMU,SRVADR=CHMX_SERVICE
                            00      DD 05A9                      PUSHL   #0
                   00000C5C'EF      DF 05AB                      PUSHAL  CHMX_SERVICE
                   0000004C 8F      DD 05B1                      PUSHL   #SCB$L_CHMU
              00010160 9F   03      FB 05B7                      CALLS   #3, @#DS$SETVEC
                                       05BE  992
                                    FC 05BE  993 2$:     XFC                             ; execute XFC instruction to cause
                                       05BF  994                                         ; exception which will get on IS
                                       05BF  995         .ALIGN  LONG
                                       05C0  996 RENTRY6:
                   00000000'EF      DC 05C0  997         MOVPSL  L_ACT_PSL               ; read PSL
           1E 00000000'EF   1A      E0 05C6  998         BBS     #PSL$V_IS,L_ACT_PSL,3$  ; br = on interrupt stack
                                       05CE  999         $DS_ERRHARD_S   UNIT=KA_UNIT_NO, MSGADR=T_NOT_ON_IS
                            00      DD 05CE                      PUSHL   #0
                   0000083C'EF      DF 05D0                      PUSHAL  T_NOT_ON_IS
                   00000000'EF      DD 05D6                      PUSHL   KA_UNIT_NO
                            01      DD 05DC                      PUSHL   #$ER
                                       05DE      ;;; TEST 3, SUBTEST 4, ERROR 1
              000100D0 9F   04      FB 05DE                      CALLS   #$$M, @#DS$ERRHARD
                                       05E5 1000         $DS_ABORT
              00010020 9F   6C      FA 05E5                      CALLG   (AP), @#DS$ABORT
     00000100'EF   00000040'EF      7D 05EC 1001 3$:     MOVQ    JUMP,RESTART            ; setup code to renter after halt
     00000108'EF   00000048'EF      7D 05F7 1002         MOVQ    JUMP+8,RESTART+8        ; load rest of rentry code
     00000004'EF   00000675'EF      DE 0602 1003         MOVAL   RENTRY7,RENTRY_POINT    ; load rentry address
                                       060D 1004 4$:     $DS_PRINTF_S    FORMAT=T_INSTRUCTIONS,P0=#CODE_0A,P1=#6$
                   0000066C'8F      DD 060D                      PUSHL   #6$
                            0A      DD 0613                      PUSHL   #CODE_0A
                   00000085'EF      9F 0615                      PUSHAB  T_INSTRUCTIONS
              000100F0 9F   03      FB 061B                      CALLS   #$$N, @#DS$PRINTF
                                       0622 1005         $DS_PRINTF_S    FORMAT=T_CONTINUE
                   000000C3'EF      9F 0622                      PUSHAB  T_CONTINUE
              000100F0 9F   01      FB 0628                      CALLS   #$$N, @#DS$PRINTF
              00000020'EF   5E      D0 062F 1006 5$:     MOVL    SP,L_CUR_ISP
00000000'EF   00000000'EF   08      C3 0636 1007         SUBL3   #8,L_ISP,L_EXP_SP       ; load expected SP
     00000000'EF   00000000'EF      D0 0642 1008         MOVL    L_KSP,L_EXP_KSP         ; load expected KSP
              00000000'EF   00      D0 064D 1009         MOVL    #0,L_EXP_ISP            ; ISP unpredictable if on int. stack
     00000000'EF   00000961'EF      D0 0654 1010         MOVL    DATA_2,L_EXP_PSL        ; load expected PSL
                   00000BDE'EF      16 065F 1011         JSB     LOAD_GPR                ; load GPR's with data
              0000003C'EF   01      C8 0665 1012         BISL2   #M_READY,L_FLAGS        ; set ready to execute flag
                            00      BF 066C 1013 6$:     CHMU    #0                      ; execute change mode instruction
              0000003C'EF   04      C8 066E 1014         BISL2   #M_EXECUTE_ERR,L_FLAGS  ; if no exception occurs will get here
                                       0675 1015 RENTRY7:                                ; will renter here when completed
           11 00000000'EF   1A      E1 0675 1016         BBC     #PSL$V_IS,L_ACT_PSL,8$  ; br = not on IS as expected
               5E  00000020'EF      D0 067D 1017         MOVL    L_CUR_ISP,SP            ; reset IS SP
               6E  0000068C'8F      D0 0684 1018         MOVL    #7$,(SP)                ; setup return address
                                    02 068B 1019         REI                             ; get off interrupt stack
                   0B    11  068C   1020 7$:      BRB      9$                           ; skip IPR load
   00000000'8F    00000020'EF    DA  068E   1021 8$:      MTPR     L_CUR_ISP,#PR$_ISP            ; load IS SP into IPR
                  00000C85'EF    16  0699   1022 9$:      JSB      ERROR_CHECK                  ; check for errors (GPR's,AP,FP,PSL)
          2C 0000003C'EF    0C    E1  069F   1023          BBC      #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                  06A7   1024          $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_CHMU_ERR
              0000028D'8F    DD  06A7                           PUSHL    #T_CHMU_ERR
              00000969'EF    DF  06AD                           PUSHAL   ERR_MESSAGE
                        00    DD  06B3                           PUSHL    #0
              00000000'EF    DD  06B5                           PUSHL    KA_UNIT_NO
                        02    DD  06BB                           PUSHL    #$ER
                                  06BD            ;;; TEST 3, SUBTEST 4, ERROR 2
          000100D0 9F    05    FB  06BD                           CALLS    #$$M, @#DS$ERRHARD
       07 0000003C'EF    08    E1  06C4   1025          BBC      #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                  06CC   1026          $DS_ABORT
          00010020 9F    6C    FA  06CC                           CALLG    (AP), @#DS$ABORT
                                  06D3   1027 10$:     $DS_CLRVEC_S     VECTOR=#SCB$L_OPCCUS
                        14    DD  06D3                           PUSHL    #SCB$L_OPCCUS
          00010168 9F    01    FB  06D5                           CALLS    #1, @#DS$CLRVEC
                                  06DC   1028          $DS_CLRVEC_S     VECTOR=#SCB$L_CHMU
              0000004C 8F    DD  06DC                           PUSHL    #SCB$L_CHMU
          00010168 9F    01    FB  06E2                           CALLS    #1, @#DS$CLRVEC
                                  06E9   1029          $DS_ENDSUB
                                  06E9            T3_S4_X:
   00010038 9F    00000024'EF    FA  06E9                           CALLG    $S$, @#DS$ENDSUB
                                  06F4   1030          $DS_PAGE
                                  06F4   1031
```

```
06F4             .SBTTL  SUBTEST 3.5:  CHMS inst. with PSL<IS>=1
06F4     ;+
06F4     ; Subtest description:
06F4     ;
06F4     ;       This subtest checks that a CHMS instruction with PSL<IS>=1, will cause
06F4     ;       the processor to HALT (code = A).
06F4     ;
06F4     ; Subtest steps:
06F4     ;
06F4     ;       SUBTEST CHMS instruction with PSL<IS>=1
06F4     ;       :  Initialize Flags
06F4     ;       :  Get XFC vector to handle exception on interrupt stack
06F4     ;       :  Get interval timer vector to prevent outside interrupts
06F4     ;       :  Get CHMS vector in case CHMS instruction does execute
06F4     ;       :  Setup code to set done flag at loc 100
06F4     ;       :  Setup code to jump to RENTRY point in next loc
06F4     ;       :  Print restart instructions to operator
06F4     ;       :  Execute an XFC instruction to get on interrupt stack
06F4     ;       :  Read current PSL
06F4     ;       :  IF NOT on interrupt stack
06F4     ;       :  :  THEN
06F4     ;       :  :  Report wrong stack error
06F4     ;       :  :  Exit test
06F4     ;       :  ENDIF
06F4     ;       :  Set ready to execute flag
06F4     ;       :  Execute CHMS to cause processor to HALT
06F4     ;       :  (this should cause a CHMS on interrupt stack HALT)
06F4     ;       :  IF CHMS does not caues an exception
06F4     ;       :  :  THEN
06F4     ;       :  :  Set exception error flag
06F4     ;       :  ENDIF
06F4     ;       :  RENTRY point (restart enters here from exception)
06F4     ;       :  IF exception error flag set
06F4     ;       :  :  THEN
06F4     ;       :  :  Report CHMS exception error
06F4     ;       :  :  Exit test
06F4     ;       :  ENDIF
06F4     ;       :  IF CHMS instruction executed flag set
06F4     ;       :  :  THEN
06F4     ;       :  :  Report change mode error
06F4     ;       :  :  Exit test
06F4     ;       :  ENDIF
06F4     ;       :  IF done flag not set
06F4     ;       :  :  THEN
06F4     ;       :  :  Report done error
06F4     ;       :  :  Exit test
06F4     ;       :  ENDIF
06F4     ;       :  Modify PC on stack to point to RENTRY2
06F4     ;       :  Execute REI to get back to correct stack
06F4     ;       :  RENTRY2 point
06F4     ;       :  Read PSL
06F4     ;       :  IF IS not clear
06F4     ;       :  :  THEN
06F4     ;       :  :  Report incorrect stack error in clean up
06F4     ;       :  :  Exit test
06F4     ;       :  ENDIF
06F4     ;       :  Release interval timer vector
```

```
                                     06F4  1090 ;          :  Release CHMS vector
                                     06F4  1091 ;          :  Release XFC vector
                                     06F4  1092 ;          ENDSUBTEST CHMS instruction with PSL<IS>=1
                                     06F4  1093 ;
                                     06F4  1094 ;-
                                     06F4  1095            $DS_BGNSUB
                                     06F4       T3_S5::
       00010030 9F    00000030'EF  FA 06F4                         CALLG   $S$, @#DS$BGNSUB
                      00000BC6'EF  16 06FF  1096            JSB     CLEAR_BUFFER                   ; clear data buffers
                      0000003C'EF  D4 0705  1097            CLRL    L_FLAGS                        ; initialize flags
                                     070B  1098            $DS_SETVEC_S    VECTOR=#SCB$L_OPCCUS,SRVADR=RENTRY8,CODE=#1
                               01  DD 070B                         PUSHL   #1
                      00000734'EF  DF 070D                         PUSHAL  RENTRY8
                               14  DD 0713                         PUSHL   #SCB$L_OPCCUS
              00010160 9F      03  FB 0715                         CALLS   #3, @#DS$SETVEC
                                     071C  1099 1$:        $DS_SETVEC_S    VECTOR=#SCB$L_CHMS,SRVADR=CHMX_SERVICE
                               00  DD 071C                         PUSHL   #0
                      00000C5C'EF  DF 071E                         PUSHAL  CHMX_SERVICE
                      00000048 8F  DD 0724                         PUSHL   #SCB$L_CHMS
              00010160 9F      03  FB 072A                         CALLS   #3, @#DS$SETVEC
                                     0731  1100
                                  FC 0731  1101 2$:        XFC                                    ; execute XFC instruction to cause
                                     0732  1102                                                   ; exception which will get on IS
                                     0732  1103            .ALIGN  LONG
                                     0734  1104 RENTRY8:
                      00000000'EF  DC 0734  1105            MOVPSL  L_ACT_PSL                      ; read PSL
                 1E 00000000'EF  1A  E0 073A  1106            BBS     #PSL$V_IS,L_ACT_PSL,3$         ; br = on interrupt stack
                                     0742  1107            $DS_ERRHARD_S    UNIT=KA_UNIT_NO, MSGADR=T_NOT_ON_IS
                               00  DD 0742                         PUSHL   #0
                      0000083C'EF  DF 0744                         PUSHAL  T_NOT_ON_IS
                      00000000'EF  DD 074A                         PUSHL   KA_UNIT_NO
                               01  DD 0750                         PUSHL   #$ER
                                     0752       ;;; TEST 3, SUBTEST 5, ERROR 1
              000100D0 9F      04  FB 0752                         CALLS   #$$M, @#DS$ERRHARD
                                     0759  1108            $DS_ABORT
              00010020 9F      6C  FA 0759                         CALLG   (AP), @#DS$ABORT
   00000100'EF   00000040'EF   7D 0760  1109 3$:        MOVQ    JUMP,RESTART                   ; setup code to renter after halt
   00000108'EF   00000048'EF   7D 076B  1110            MOVQ    JUMP+8,RESTART+8               ; load rest of rentry code
   00000004'EF   000007E9'EF   DE 0776  1111            MOVAL   RENTRY9,RENTRY_POINT           ; load rentry address
                                     0781  1112 4$:        $DS_PRINTF_S    FORMAT=T_INSTRUCTIONS,P0=#CODE_0A,P1=#6$
                      000007E0'8F  DD 0781                         PUSHL   #6$
                               0A  DD 0787                         PUSHL   #CODE_0A
                      00000085'EF  9F 0789                         PUSHAB  T_INSTRUCTIONS
              000100F0 9F      03  FB 078F                         CALLS   #$$N, @#DS$PRINTF
                                     0796  1113            $DS_PRINTF_S    FORMAT=T_CONTINUE
                      000000C3'EF  9F 0796                         PUSHAB  T_CONTINUE
              000100F0 9F      01  FB 079C                         CALLS   #$$N, @#DS$PRINTF
                 00000020'EF   5E  D0 07A3  1114 5$:        MOVL    SP,L_CUR_ISP
   00000000'EF   000000C0'EF   08  C3 07AA  1115            SUBL3   #8,L_ISP,L_EXP_SP              ; load expected SP
      00000000'EF   00000000'EF   D0 07B6  1116            MOVL    L_KSP,L_EXP_KSP                ; load expected KSP
                 00000000'EF   00  D0 07C1  1117            MOVL    #0,L_EXP_ISP                   ; ISP unpredictable if on int. stack
      00000000'EF   00000961'EF   D0 07C8  1118            MOVL    DATA_2,L_EXP_PSL               ; load expected PSL
                      00000BDE'EF  16 07D3  1119            JSB     LOAD_GPR                       ; load GPR's with data
                 0000003C'EF   01  C8 07D9  1120            BISL2   #M_READY,L_FLAGS               ; set ready to execute flag
                               00  BE 07E0  1121 6$:        CHMS    #0                             ; execute change mode instruction
                 00C0003C'EF   04  C8 07E2  1122            BISL2   #M_EXECUTE_ERR,L_FLAGS         ; if no exception occurs will get here
                                     07E9  1123 RENTRY9:                                          ; will renter here when completed
       11 00000000'EF    1A   E1  07E9  1124          BBC     #PSL$V_IS,L_ACT_PSL,8$  ; br = not on IS as expected
          5E    00000020'EF   D0  07F1  1125          MOVL    L_CUR_ISP,SP            ; reset IS SP
          6E    00000800'8F   D0  07F8  1126          MOVL    #7$,(SP)                ; setup return address
                              02  07FF  1127          REI                             ; get off interrupt stack
                         0B   11  0800  1128 7$:      BRB     9$                      ; skip IPR load
   00000000'8F  00000020'EF   DA  0802  1129 8$:      MTPR    L_CUR_ISP,#PR$_ISP      ; load IS SP into IPR
                00000C85'EF   16  080D  1130 9$:      JSB     ERROR_CHECK             ; check for errors (GPR's,AP,FP,PSL)
       2C 0000003C'EF    0C   E1  0813  1131          BBC     #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                  081B  1132          $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_CHMS_ERR
                000002B5'8F   DD  081B                         PUSHL    #T_CHMS_ERR
                00000969'EF   DF  0821                         PUSHAL   ERR_MESSAGE
                         00   DD  0827                         PUSHL    #0
                00000000'EF   DD  0829                         PUSHL    KA_UNIT_NO
                         02   DD  082F                         PUSHL    #$ER
                                  0831             ;;; TEST 3, SUBTEST 5, ERROR 2
          000100D0 9F    05   FB  0831                         CALLS    #$$M, @#DS$ERRHARD
       07 0000003C'EF    08   E1  0838  1133          BBC     #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                  0840  1134          $DS_ABORT
          00010020 9F    6C   FA  0840                         CALLG    (AP), @#DS$ABORT
                                  0847  1135 10$:     $DS_CLRVEC_S     VECTOR=#SCB$L_OPCCUS
                         14   DD  0847                         PUSHL    #SCB$L_OPCCUS
          00010168 9F    01   FB  0849                         CALLS    #1, @#DS$CLRVEC
                                  0850  1136          $DS_CLRVEC_S     VECTOR=#SCB$L_CHMS
                00000048 8F   DD  0850                         PUSHL    #SCB$L_CHMS
          00010168 9F    01   FB  0856                         CALLS    #1, @#DS$CLRVEC
                                  085D  1137          $DS_ENDSUB
                                  085D             T3_S5_X:
   00010038 9F  00000030'EF   FA  085D                         CALLG    $S$, @#DS$ENDSUB
                                  0868  1138          $DS_PAGE
```

```
0868                .SBTTL  SUBTEST 3.6:  CHME inst. with PSL<IS>=1
0868     ;+
0868     ; Subtest description:
0868     ;
0868     ;          This subtest checks that a CHME instruction with PSL<IS>=1, will cause
0868     ;          the processor to HALT (code = A).
0868     ;
0868     ; Subtest steps:
0868     ;
0868     ;          SUBTEST CHME instruction with PSL<IS>=1
0868     ;          :  Initialize Flags
0868     ;          :  Get XFC vector to handle exception on interrupt stack
0868     ;          :  Get interval timer vector to prevent outside interrupts
0868     ;          :  Get CHME vector in case CHME instruction does execute
0868     ;          :  Setup code to set done flag at loc 100
0868     ;          :  Setup code to jump to RENTRY point in next loc
0868     ;          :  Print restart instructions to operator
0868     ;          :  Execute an XFC instruction to get on interrupt stack
0868     ;          :  Read current PSL
0868     ;          :  IF NOT on interrupt stack
0868     ;          :  :  THEN
0868     ;          :  :  Report wrong stack error
0868     ;          :  :  Exit test
0868     ;          :  ENDIF
0868     ;          :  Set ready to execute flag
0868     ;          :  Execute CHME to cause processor to HALT
0868     ;          :  (this should cause a CHME on interrupt stack HALT)
0868     ;          :  IF CHME does not caues an exception
0868     ;          :  :  THEN
0868     ;          :  :  Set exception error flag
0868     ;          :  ENDIF
0868     ;          :  RENTRY point (restart enters here from exception)
0868     ;          :  IF exception error flag set
0868     ;          :  :  THEN
0868     ;          :  :  Report CHME exception error
0868     ;          :  :  Exit test
0868     ;          :  ENDIF
0868     ;          :  IF CHME instruction executed flag set
0868     ;          :  :  THEN
0868     ;          :  :  Report change mode error
0868     ;          :  :  Exit test
0868     ;          :  ENDIF
0868     ;          :  IF done flag not set
0868     ;          :  :  THEN
0868     ;          :  :  Report done error
0868     ;          :  :  Exit test
0868     ;          :  ENDIF
0868     ;          :  Mcdify PC on stack to point to RENTRY2
0868     ;          :  Execute REI to get back to correct stack
0868     ;          :  RENTRY2 point
0868     ;          :  Read PSL
0868     ;          :  IF IS not clear
0868     ;          :  :  THEN
0868     ;          :  :  Report incorrect stack error in clean up
0868     ;          :  :  Exit test
0868     ;          :  ENDIF
0868     ;          :  Release interval timer vector
```

```
                                      0868  1197 ;        :  Release CHME vector
                                      0868  1198 ;        :  Release XFC vector
                                      0868  1199 ;        ENDSUBTEST CHME instruction with PSL<IS>=1
                                      0868  1200 ;
                                      0868  1201 ;-
                                      0868  1202          $DS_BGNSUB
                                      0868       T3_S6::
     00010030 9F     0000003C'EF  FA  0868                         CALLG   $S$, @#DS$BGNSUB
                     00000BC6'EF  16  0873  1203          JSB      CLEAR_BUFFER             ; clear data buffers
                     0000003C'EF  D4  0879  1204          CLRL     L_FLAGS                  ; initialize flags
                                      087F  1205          $DS_SETVEC_S      VECTOR=#SCB$L_OPCCUS,SRVADR=RENTRY10,CODE=#1
                              01  DD  087F                         PUSHL   #1
                     000008A8'EF  DF  0881                         PUSHAL  RENTRY10
                              14  DD  0887                         PUSHL   #SCB$L_OPCCUS
        00010160 9F           03  FB  0889                         CALLS   #3, @#DS$SETVEC
                                      0890  1206 1$:      $DS_SETVEC_S      VECTOR=#SCB$L_CHME,SRVADR=CHMX_SERVICE
                              00  DD  0890                         PUSHL   #0
                     00000C5C'EF  DF  0892                         PUSHAL  CHMX_SERVICE
                     00000044 8F  DD  0898                         PUSHL   #SCB$L_CHME
        00010160 9F           03  FB  089E                         CALLS   #3, @#DS$SETVEC
                                      08A5  1207
                                  FC  08A5  1208 2$:      XFC                               ; execute XFC instruction to cause
                                      08A6  1209                                            ; exception which will get on IS
                                      08A6  1210          .ALIGN  LONG
                                      08A8  1211 RENTRY10:
                     00000000'EF  DC  08A8  1212          MOVPSL   L_ACT_PSL                ; read PSL
        1E 00000000'EF        1A  E0  08AE  1213          BBS      #PSL$V_IS,L_ACT_PSL,3$   ; br = on interrupt stack
                                      08B6  1214          $DS_ERRHARD_S     UNIT=KA_UNIT_NO, MSGADR=T_NOT_ON_IS
                              00  DD  08B6                         PUSHL   #0
                     0000083C'EF  DF  08B8                         PUSHAL  T_NOT_ON_IS
                     00000000'EF  DD  08BE                         PUSHL   KA_UNIT_NO
                              01  DD  08C4                         PUSHL   #$ER
                                      08C6       ;;; TEST 3, SUBTEST 6, ERROR 1
        000100D0 9F           04  FB  08C6                         CALLS   #$$M, @#DS$ERRHARD
                                      08CD  1215          $DS_ABORT
        00010020 9F           6C  FA  08CD                         CALLG   (AP), @#DS$ABORT
   00000100'EF     00000040'EF  7D  08D4  1216 3$:      MOVQ     JUMP,RESTART             ; setup code to renter after halt
   00000108'EF     00000048'EF  7D  08DF  1217          MOVQ     JUMP+8,RESTART+8         ; load rest of rentry code
   00000004'EF     0000095D'EF  DE  08EA  1218          MOVAL    RENTRY11,RENTRY_POINT    ; load rentry address
                                      08F5  1219 4$:      $DS_PRINTF_S      FORMAT=T_INSTRUCTIONS,P0=#CODE_0A,P1=#6$
                     00000954'8F  DD  08F5                         PUSHL   #6$
                              0A  DD  08FB                         PUSHL   #CODE_0A
                     00000085'EF  9F  08FD                         PUSHAB  T_INSTRUCTIONS
        000100F0 9F           03  FB  0903                         CALLS   #$$N, @#DS$PRINTF
                                      090A  1220          $DS_PRINTF_S      FORMAT=T_CONTINUE
                     000000C3'EF  9F  090A                         PUSHAB  T_CONTINUE
        000100F0 9F           01  FB  0910                         CALLS   #$$N, @#DS$PRINTF
                     00000020'EF  5E  D0  0917  1221 5$:      MOVL     SP,L_CUR_ISP
00000000'EF      00000000'EF     08  C3  091E  1222          SUBL3    #8,L_ISP,L_EXP_SP        ; load expected SP
   00000000'EF     00000000'EF      D0  092A  1223          MOVL     L_KSP,L_EXP_KSP          ; load expected KSP
                     00000000'EF  00  D0  0935  1224          MOVL     #0,L_EXP_ISP             ; ISP unpredictable if on int. stack
   00000000'EF     00000961'EF      D0  093C  1225          MOVL     DATA_2,L_EXP_PSL         ; load expected PSL
                     00000BDE'EF  16  0947  1226          JSB      LOAD_GPR                 ; load GPR's with data
                     0000003C'EF  01  C8  094D  1227          BISL2    #M_READY,L_FLAGS         ; set ready to execute flag
                              00  BD  0954  1228 6$:      CHME     #0                       ; execute change mode instruction
                     0000003C'EF  04  C8  0956  1229          BISL2    #M_EXECUTE_ERR,L_FLAGS   ; if no exception occurs will get here
                                      095D  1230 RENTRY11:                                  ; will renter here when completed
```

ZZ-EN
ENKAX
1-3

```
            11 00000000'EF   1A    E1 095D  1231         BBC     #PSL$V_IS,L_ACT_PSL,8$    ; br = not on IS as expected
               5E   00000020'EF    D0 0965  1232         MOVL    L_CUR_ISP,SP              ; reset IS SP
               6E   00000974'8F    D0 096C  1233         MOVL    #7$,(SP)                  ; setup return address
                                   02 0973  1234         REI                               ; get off interrupt stack
                             0B    11 0974  1235 7$:     BRB     9$                        ; skip IPR load
      00000000'8F   00000020'EF    DA 0976  1236 8$:     MTPR    L_CUR_ISP,#PR$_ISP        ; load IS SP into IPR
                    00000C85'EF    16 0981  1237 9$:     JSB     ERROR_CHECK               ; check for errors (GPR's,AP,FP,PSL)
            2C 0000003C'EF   0C    E1 0987  1238         BBC     #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                      098F  1239         $DS_ERRHARD_S   UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_CHME_ERR
                    000002DD'8F    DD 098F                       PUSHL  #T_CHME_ERR
                    00000969'EF    DF 0995                       PUSHAL ERR_MESSAGE
                             00    DD 099B                       PUSHL  #0
                    00000000'EF    DD 099D                       PUSHL  KA_UNIT_NO
                             02    DD 09A3                       PUSHL  #$ER
                                      09A5       ;;; TEST 3, SUBTEST 6, ERROR 2
               000100D0 9F   05    FB 09A5                       CALLS  #$$M, @#DS$ERRHARD
            07 0000003C'EF   08    E1 09AC  1240         BBC     #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                      09B4  1241         $DS_ABORT
               00010020 9F   6C    FA 09B4                       CALLG  (AP), @#DS$ABORT
                                      09BB  1242 10$:    $DS_CLRVEC_S   VECTOR=#SCB$L_OPCCUS
                             14    DD 09BB                       PUSHL  #SCB$L_OPCCUS
               00010168 9F   01    FB 09BD                       CALLS  #1, @#DS$CLRVEC
                                      09C4  1243         $DS_CLRVEC_S   VECTOR=#SCB$L_CHME
                    00000044 8F    DD 09C4                       PUSHL  #SCB$L_CHME
               00010168 9F   01    FB 09CA                       CALLS  #1, @#DS$CLRVEC
                                      09D1  1244         $DS_ENDSUB
                                      09D1       T3_S6_X:
      00010038 9F   0000003C'EF    FA 09D1                       CALLG  $S$, @#DS$ENDSUB
                                      09DC  1245         $DS_PAGE
```

```
09DC              .SBTTL  SUBTEST 3.7:  CHMK inst. with PSL<IS>=1
09DC       ;+
09DC       ; Subtest description:
09DC       ;
09DC       ;         This subtest checks that a CHMK instruction with PSL<IS>=1, will cause
09DC       ;         the processor to HALT (code = A).
09DC       ;
09DC       ; Subtest steps:
09DC       ;
09DC       ;         SUBTEST CHMK instruction with PSL<IS>=1
09DC       ;         :  Initialize Flags
09DC       ;         :  Get XFC vector to handle exception on interrupt stack
09DC       ;         :  Get interval timer vector to prevent outside interrupts
09DC       ;         :  Get CHMK vector in case CHMK instruction does execute
09DC       ;         :  Setup code to set done flag at loc 100
09DC       ;         :  Setup code to jump to RENTRY point in next loc
09DC       ;         :  Print restart instructions to operator
09DC       ;         :  Execute an XFC instruction to get on interrupt stack
09DC       ;         :  Read current PSL
09DC       ;         :  IF NOT on interrupt stack
09DC       ;         :  :  THEN
09DC       ;         :  :  Report wrong stack error
09DC       ;         :  :  Exit test
09DC       ;         :  ENDIF
09DC       ;         :  Set ready to execute flag
09DC       ;         :  Execute CHMK to cause processor to HALT
09DC       ;         :  (this should cause a CHMK on interrupt stack HALT)
09DC       ;         :  IF CHMK does not caues an exception
09DC       ;         :  :  THEN
09DC       ;         :  :  Set exception error flag
09DC       ;         :  ENDIF
09DC       ;         :  RENTRY point (restart enters here from exception)
09DC       ;         :  IF exception error flag set
09DC       ;         :  :  THEN
09DC       ;         :  :  Report CHMK exception error
09DC       ;         :  :  Exit test
09DC       ;         :  ENDIF
09DC       ;         :  IF CHMK instruction executed flag set
09DC       ;         :  :  THEN
09DC       ;         :  :  Report change mode error
09DC       ;         :  :  Exit test
09DC       ;         :  ENDIF
09DC       ;         :  IF done flag not set
09DC       ;         :  :  THEN
09DC       ;         :  :  Report done error
09DC       ;         :  :  Exit test
09DC       ;         :  ENDIF
09DC       ;         :  Modify PC on stack to point to RENTRY2
09DC       ;         :  Execute REI to get back to correct stack
09DC       ;         :  RENTRY2 point
09DC       ;         :  Read PSL
09DC       ;         :  IF IS not clear
09DC       ;         :  :  THEN
09DC       ;         :  :  Report incorrect stack error in clean up
09DC       ;         :  :  Exit test
09DC       ;         :  ENDIF
09DC       ;         :  Release interval timer vector
```

```
                                      09DC  1304 ;       :  Release CHMK vector
                                      09DC  1305 ;       :  Release XFC vector
                                      09DC  1306 ;       ENDSUBTEST CHMK instruction with PSL<IS>=1
                                      09DC  1307 ;
                                      09DC  1308 ;-
                                      09DC  1309         $DS_BGNSUB
                                      09DC       T3_S7::
     00010030 9F    00000048'EF   FA  09DC                        CALLG   $S$, @#DS$BGNSUB
                    00000BC6'EF   16  09E7  1310         JSB      CLEAR_BUFFER            ; clear data buffers
                    0000003C'EF   D4  09ED  1311         CLRL     L_FLAGS                 ; initialize flags
                                      09F3  1312         $DS_SETVEC_S     VECTOR=#SCB$L_OPCCUS,SRVADR=RENTRY12,CODE=#1
                             01   DD  09F3                        PUSHL   #1
                    00000A1C'EF   DF  09F5                        PUSHAL  RENTRY12
                             14   DD  09FB                        PUSHL   #SCB$L_OPCCUS
              00010160 9F    03   FB  09FD                        CALLS   #3, @#DS$SETVEC
                                      0A04  1313 1$:     $DS_SETVEC_S     VECTOR=#SCB$L_CHMK,SRVADR=CHMX_SERVICE
                             00   DD  0A04                        PUSHL   #0
                    00000C5C'EF   DF  0A06                        PUSHAL  CHMX_SERVICE
                    00000040 8F   DD  0A0C                        PUSHL   #SCB$L_CHMK
              00010160 9F    03   FB  0A12                        CALLS   #3, @#DS$SETVEC
                                      0A19  1314
                                  FC  0A19  1315 2$:     XFC                              ; execute XFC instruction to cause
                                      0A1A  1316                                          ; exception which will get on IS
                                      0A1A  1317         .ALIGN   LONG
                                      0A1C  1318 RENTRY12:
                    00000000'EF   DC  0A1C  1319         MOVPSL   L_ACT_PSL               ; read PSL
           1E 00000000'EF    1A   E0  0A22  1320         BBS      #PSL$V_IS,L_ACT_PSL,3$  ; br = on interrupt stack
                                      0A2A  1321         $DS_ERRHARD_S    UNIT=KA_UNIT_NO, MSGADR=T_NOT_ON_IS
                             00   DD  0A2A                        PUSHL   #0
                    0000083C'EF   DF  0A2C                        PUSHAL  T_NOT_ON_IS
                    00000000'EF   DD  0A32                        PUSHL   KA_UNIT_NO
                             01   DD  0A38                        PUSHL   #$ER
                                      0A3A       ;;; TEST 3, SUBTEST 7, ERROR 1
              000100D0 9F    04   FB  0A3A                        CALLS   #$$M, @#DS$ERRHARD
                                      0A41  1322         $DS_ABORT
              00010020 9F    6C   FA  0A41                        CALLG   (AP), @#DS$ABORT
     00000100'EF    00000040'EF   7D  0A48  1323 3$:     MOVQ     JUMP,RESTART            ; setup code to renter after halt
     00000108'EF    00000048'EF   7D  0A53  1324         MOVQ     JUMP+8,RESTART+8        ; load rest of rentry code
     00000004'EF    00000AD1'EF   DE  0A5E  1325         MOVAL    RENTRY13,RENTRY_POINT   ; load rentry address
                                      0A69  1326 4$:     $DS_PRINTF_S     FORMAT=T_INSTRUCTIONS,P0=#CODE_0A,P1=#6$
                    00000AC8'8F   DD  0A69                        PUSHL   #6$
                             0A   DD  0A6F                        PUSHL   #CODE_0A
                    00000085'EF   9F  0A71                        PUSHAB  T_INSTRUCTIONS
              000100F0 9F    03   FB  0A77                        CALLS   #$$N, @#DS$PRINTF
                                      0A7E  1327         $DS_PRINTF_S     FORMAT=T_CONTINUE
                    000000C3'EF   9F  0A7E                        PUSHAB  T_CONTINUE
              000100F0 9F    01   FB  0A84                        CALLS   #$$N, @#DS$PRINTF
              00000020'EF    5E   D0  0A8B  1328 5$:     MOVL     SP,L_CUR_ISP
00000000'EF   00000000'EF    08   C3  0A92  1329         SUBL3    #8,L_ISP,L_EXP_SP       ; load expected SP
     00000000'EF    00000000'EF   D0  0A9E  1330         MOVL     L_KSP,L_EXP_KSP         ; load expected KSP
              00000000'EF    00   D0  0AA9  1331         MOVL     #0,L_EXP_ISP            ; ISP unpredictable if on int. stack
     00000000'EF    00000961'EF   D0  0AB0  1332         MOVL     DATA_2,L_EXP_PSL        ; load expected PSL
                    00000BDE'EF   16  0ABB  1333         JSB      LOAD_GPR                ; load GPR's with data
              0000003C'EF    01   C8  0AC1  1334         BISL2    #M_READY,L_FLAGS        ; set ready to execute flag
                             00   BC  0AC8  1335 6$:     CHMK     #0                      ; execute change mode instruction
              0000003C'EF    04   C8  0ACA  1336         BISL2    #M_EXECUTE_ERR,L_FLAGS  ; if no exception occurs will get here
                                      0AD1  1337 RENTRY13:                                ; will renter here when completed
```

```
        11 00000000'EF      1A    E1  0AD1  1338          BBC      #PSL$V_IS,L_ACT_PSL,8$  ; br = not on IS as expected
           5E   00000020'EF       D0  0AD9  1339          MOVL     L_CUR_ISP,SP            ; reset IS SP
           6E   00000AE8'8F       D0  0AE0  1340          MOVL     #7$,(SP)                ; setup return address
                                  02  0AE7  1341          REI                              ; get off interrupt stack
                            0B    11  0AE8  1342 7$:      BRB      9$                      ; skip IPR load
   00000000'8F  00000020'EF       DA  0AEA  1343 8$:      MTPR     L_CUR_ISP,#PR$_ISP      ; load IS SP into IPR
                00000C85'EF       16  0AF5  1344 9$:      JSB      ERROR_CHECK             ; check for errors (GPR's,AP,FP,PSL)
        2C 0000003C'EF      0C    E1  0AFB  1345          BBC      #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                      0B03  1346          $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_CHMK_ERR
                00000305'8F       DD  0B03                         PUSHL    #T_CHMK_ERR
                00000969'EF       DF  0B09                         PUSHAL   ERR_MESSAGE
                          00      DD  0B0F                         PUSHL    #0
                00000000'EF       DD  0B11                         PUSHL    KA_UNIT_NO
                          02      DD  0B17                         PUSHL    #$ER
                                      0B19        ;;; TEST 3, SUBTEST 7, ERROR 2
        000100D0 9F         05    FB  0B19                         CALLS    #$$M, @#DS$ERRHARD
        07 0000003C'EF      08    E1  0B20  1347          BBC      #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                      0B28  1348          $DS_ABORT
        00010020 9F         6C    FA  0B28                         CALLG    (AP), @#DS$ABORT
                                      0B2F  1349 10$:     $DS_CLRVEC_S     VECTOR=#SCB$L_OPCCUS
                            14    DD  0B2F                         PUSHL    #SCB$L_OPCCUS
        00010168 9F         01    FB  0B31                         CALLS    #1, @#DS$CLRVEC
                                      0B38  1350          $DS_CLRVEC_S     VECTOR=#SCB$L_CHMK
                00000040 8F       DD  0B38                         PUSHL    #SCB$L_CHMK
        00010168 9F         01    FB  0B3E                         CALLS    #1, @#DS$CLRVEC
                                      0B45  1351          $DS_ENDSUB
                                      0B45        T3_S7_X:
   00010038 9F  00000048'EF       FA  0B45                         CALLG    $S$, @#DS$ENDSUB
                                      0B50  1352          $DS_CLRVEC_S     VECTOR=#SCB$L_TIMER
                000000C0 8F       DD  0B50                         PUSHL    #SCB$L_TIMER
        00010168 9F         01    FB  0B56                         CALLS    #1, @#DS$CLRVEC
                                      0B5D  1353          $DS_ENDTEST
                      50    01    D0  0B5D                         MOVL     #1, R0             ; NORMAL EXIT
                                      0B60        TEST_003_X::
        00010058 9F         6E    FA  0B60                         CALLG    (SP), @#DS$BREAK
                                  04  0B67                         RET                         ; RETURN TO TEST SEQUENCER
                                      0B68  1354          $DS_PAGE
                                      0B68  1355
                            0B68              .SBTTL  TEST 4:  PROCESSOR HALTS ARCH. UNDEFINED
                        00000000                      .PSECT  TEST_004, PAGE, NOWRT
                            0024
                            0024  1358 ;++
                            0024  1359 ; Test description:
                            0024  1360 ;
                            0024  1361 ;        This test checks the various ways the VAX-11/730 processor can
                            0024  1362 ;        be halted in an architecturally undefined manner. This includes
                            0024  1363 ;        change mode instructions with the vector specifying service on
                            0024  1364 ;        the interrupt stack, invalid vector halt, SCBB read error halt,
                            0024  1365 ;        double machine check halt, and transfer to NXM user WCS halt.
                            0024  1366 ;
                            0024  1367 ;        INSTRUCTIONS FOR EARLY ABORT:  If it is desired to exit the test
                            0024  1368 ;        before completion, one must wait for the console prompt ( >>> )
                            0024  1369 ;        after the halt occurs and type in the sequence D PC adr <CR>
                            0024  1370 ;        C <CR>, where adr is the absolute address of the label
                            0024  1371 ;        TEST_004_X:: in the program listing.
                            0024  1372 ;
                            0024  1373 ;--
                            0024  1374
                            0024  1375
                            0024  1376          $DS_BGNTEST     <MANUAL,HALT,ALL>
                            0024       DATA_004:
            00000000        0024                      .LONG   0                       ; TEST ARGUMENT TABLE TERMINATOR
                            0028       TEST_004::
                0000        0028                      .WORD   ^M<>                    ; ENTRY MASK
                            002A  1377
      00000000'EF     D5    002A  1378          TSTL    KA_PTABLE                       ; CPU selected?
               10     18    0030  1379          BGEQ    5$                              ; br = CPU selected
                            0032  1380          $DS_PRINTF_S    FORMAT=T_NO_KA730 ; print exit warning
      0000004D'EF     9F    0032                      PUSHAB  T_NO_KA730
   000100F0 9F  01    FB    0038                      CALLS   #$$N, @#DS$PRINTF
                            003F  1381          $DS_EXIT        TEST                    ; exit test
             099E     31    003F                      BRW     TEST_004_X              ; EXIT TEST 4
                            0042  1382 ;
                            0042  1383 ; Ask operator if Auto Restart Switch is in off position, continue if YES, exit
                            0042  1384 ; test if NO.
                            0042  1385 ;
                            0042  1386 5$:      $DS_PRINTF_S    FORMAT=T_WARNING        ; print warning
      00000129'EF     9F    0042                      PUSHAB  T_WARNING
   000100F0 9F  01    FB    0048                      CALLS   #$$N, @#DS$PRINTF
                            004F  1387
                            004F  1388          $DS_ASKLGCL_S   MSGADR=T_REST_OFF,-     ; ask operator
                            004F  1389                          DATADR=B_ANSWER,-       ; location of answer
                            004F  1390                          YEXFER=7$,-             ; br to 7$ if YES
                            004F  1391                          DEFALT=PAR$_NO          ; default is NO
               00     DD    004F                      PUSHL   #0
      00000000'EF     DD    0051                      PUSHL   PAR$_NO
               00     DD    0057                      PUSHL   #0
      00000084'EF     DF    0059                      PUSHAL  7$
               00     DD    005F                      PUSHL   #0
      00000000'EF     DF    0061                      PUSHAL  B_ANSWER
      00000191'EF     DF    0067                      PUSHAL  T_REST_OFF
   00010098 9F  07    FB    006D                      CALLS   #7, @#DS$ASKLGCL
                            0074  1392
                            0074  1393          $DS_PRINTF_S    FORMAT=T_EXITING        ; print warning
      00000114'EF     9F    0074                      PUSHAB  T_EXITING
```

```
          000100F0 9F    01    FB  007A                     CALLS   #$$N, @#DS$PRINTF
                                   0081  1394          $DS_EXIT        TEST              ; exit test if NO
                   095C    31      0081                     BRW     TEST_004_X      ; EXIT TEST 4
                                   0084  1395
          00000000'EF    5E    D0  0084  1396 7$:      MOVL    SP,L_KSP               ; save initial KSP
  00000000'EF    00000000'8F   DB  008B  1397          MFPR    #PR$_ISP,L_ISP         ; save initial ISP
                00000BC6'EF    16  0096  1398          JSB     CLEAR_BUFFER           ; clear buffer area
                                   009C  1399          $DS_SETVEC_S    VECTOR=#SCB$L_TIMER, SRVADR=TIMER_SERVICE
                        00     DD  009C                     PUSHL   #0
                00000C54'EF    DF  009E                     PUSHAL  TIMER_SERVICE
                000000C0 8F    DD  00A4                     PUSHL   #SCB$L_TIMER
          00010160 9F    03    FB  00AA                     CALLS   #3, @#DS$SETVEC
                                   00B1  1400 10$:
                                   00B1  1401          $DS_PAGE
```

```
                                  00B1              .SBTTL  SUBTEST 4.1:  CHMU inst. with vector service on IS
                                  00B1  1404 ;+
                                  00B1  1405 ; Subtest description:
                                  00B1  1406 ;
                                  00B1  1407 ;          This subtest checks that a CHMU instruction with the SCB vector entry
                                  00B1  1408 ;          <1:0>=1 specifying service on the interrupt stack will cause
                                  00B1  1409 ;          the processor to HALT (code = B).
                                  00B1  1410 ;
                                  00B1  1411 ; Subtest steps:
                                  00B1  1412 ;
                                  00B1  1413 ;          SUBTEST CHMU instruction with vector service on IS
                                  00B1  1414 ;          :  Initialize Flags
                                  00B1  1415 ;          :  Get interval timer vector to prevent outside interrupts
                                  00B1  1416 ;          :  Get CHMU vector specifying service on IS
                                  00B1  1417 ;          :  Setup code to set done flag at loc 100
                                  00B1  1418 ;          :  Setup code to jump to RENTRY point in next loc
                                  00B1  1419 ;          :  Print restart instructions to operator
                                  00B1  1420 ;          :  Set ready to execute flag
                                  00B1  1421 ;          :  Execute CHMU to cause processor to HALT
                                  00B1  1422 ;          :  (this should cause a CHMU service on interrupt stack HALT)
                                  00B1  1423 ;          :  IF CHMU does not caues an exception
                                  00B1  1424 ;          :  :  THEN
                                  00B1  1425 ;          :  :  Set exception error flag
                                  00B1  1426 ;          :  ENDIF
                                  00B1  1427 ;          :  RENTRY point (restart enters here from exception)
                                  00B1  1428 ;          :  IF exception error flag set
                                  00B1  1429 ;          :  :  THEN
                                  00B1  1430 ;          :  :  Report CHMU exception error
                                  00B1  1431 ;          :  :  Exit test
                                  00B1  1432 ;          :  ENDIF
                                  00B1  1433 ;          :  IF CHMU instruction executed flag set
                                  00B1  1434 ;          :  :  THEN
                                  00B1  1435 ;          :  :  Report change mode error
                                  00B1  1436 ;          :  :  Exit test
                                  00B1  1437 ;          :  ENDIF
                                  00B1  1438 ;          :  IF done flag not set
                                  00B1  1439 ;          :  :  THEN
                                  00B1  1440 ;          :  :  Report done error
                                  00B1  1441 ;          :  :  Exit test
                                  00B1  1442 ;          :  ENDIF
                                  00B1  1443 ;          :  Read PSL
                                  00B1  1444 ;          :  IF IS not clear
                                  00B1  1445 ;          :  :  THEN
                                  00B1  1446 ;          :  :  Report incorrect stack error in clean up
                                  00B1  1447 ;          :  :  Exit test
                                  00B1  1448 ;          :  ENDIF
                                  00B1  1449 ;          :  Release interval timer vector
                                  00B1  1450 ;          :  Release CHMU vector
                                  00B1  1451 ;          ENDSUBTEST CHMU instruction with
                                  00B1  1452 ;
                                  00B1  1453 ;-
                                  00B1  1454            $DS_BGNSUB
                                  00B1       T4_S1::
   00010030 9F     00000054'EF  FA  00B1                  CALLG   $S$, @#DS$BGNSUB
                   00000BC6'EF  16  00BC  1455            JSB     CLEAR_BUFFER            ; clear data buffers
                   0000003C'EF  D4  00C2  1456            CLRL    L_FLAGS                 ; initialize flags
                                    00C8  1457 1$:        $DS_SETVEC_S    VECTOR=#SCB$L_CHMU,SRVADR=CHMX_SERVICE,CODE=#1
```

```
ZZ-E
ENKA
1-3

000
```

```
                        01  DD  00C8                         PUSHL   #1
              00000C5C'EF   DF  00CA                         PUSHAL  CHMX_SERVICE
              0000004C 8F   DD  00D0                         PUSHL   #SCB$L_CHMU
        00010160 9F     03  FB  00D6                         CALLS   #3, @#DS$SETVEC
                                00DD  1458
 00000100'EF  00000040'EF   7D  00DD  1459 3$:     MOVQ     JUMP,RESTART                ; setup code to renter after halt
 00000108'EF  00000048'EF   7D  00E8  1460         MOVQ     JUMP+8,RESTART+8            ; load rest of rentry code
 00000004'EF  0000016D'EF   DE  00F3  1461         MOVAL    RENTRY15,RENTRY_POINT       ; load rentry address
                                00FE  1462 4$:     $DS_PRINTF_S    FORMAT=T_INSTRUCTIONS,P0=#CODE_0B,P1=#6$
              00000164'8F   DD  00FE                         PUSHL   #6$
                        0B  DD  0104                         PUSHL   #CODE_0B
              00000085'EF   9F  0106                         PUSHAB  T_INSTRUCTIONS
        000100F0 9F     03  FB  010C                         CALLS   #$$N, @#DS$PRINTF
                                0113  1463         $DS_PRINTF_S    FORMAT=T_CONTINUE
              000000C3'EF   9F  0113                         PUSHAB  T_CONTINUE
        000100F0 9F     01  FB  0119                         CALLS   #$$N, @#DS$PRINTF
 00000020'EF  00000000'EF   D0  0120  1464 5$:     MOVL     L_ISP,L_CUR_ISP             ; save current IS SP
 00000000'EF  00000000'EF   D0  012B  1465         MOVL     L_KSP,L_EXP_SP              ; load expected SP
 00000000'EF  00000000'EF   D0  0136  1466         MOVL     L_KSP,L_EXP_KSP             ; load expected KSP
 00000000'EF  00000000'EF   D0  0141  1467         MOVL     L_ISP,L_EXP_ISP             ; load expected ISP
 00000000'EF  0000095D'EF   D0  014C  1468         MOVL     DATA_1,L_EXP_PSL            ; load expected PSL
              00000BDE'EF   16  0157  1469         JSB      LOAD_GPR                    ; load GPR's with data
      0000003C'EF       01  C8  015D  1470         BISL2    #M_READY,L_FLAGS            ; set ready to execute flag
                        00  BF  0164  1471 6$:     CHMU     #0                          ; execute change mode instruction
      0000003C'EF       04  C8  0166  1472         BISL2    #M_EXECUTE_ERR,L_FLAGS      ; if no exception occurs will get here
                                016D  1473 RENTRY15:                                    ; will renter here when completed
     1C 00000000'EF     1A  E1  016D  1474         BBC      #PSL$V_IS,L_ACT_PSL,9$      ; br = not on IS as expected
      5E  00000020'EF       D0  0175  1475         MOVL     L_CUR_ISP,SP                ; reset IS SP
      6E  00000184'8F       D0  017C  1476         MOVL     #7$,(SP)                    ; setup return address
                            02  0183  1477         REI                                  ; get off interrupt stack
                        0B  11  0184  1478 7$:     BRB      9$                          ; skip IPR load
 00000000'8F  00000020'EF   DA  0186  1479 8$:     MTPR     L_CUR_ISP,#PR$_ISP          ; load IS SP into IPR
              00000C85'EF   16  0191  1480 9$:     JSB      ERROR_CHECK                 ; check for errors (GPR's,AP,FP,PSL)
     2C 0000003C'EF     0C  E1  0197  1481         BBC      #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                019F  1482         $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_CHMUSCB_ERR
              000003F1'8F   DD  019F                         PUSHL   #T_CHMUSCB_ERR
              00000969'EF   DF  01A5                         PUSHAL  ERR_MESSAGE
                        00  DD  01AB                         PUSHL   #0
              00000000'EF   DD  01AD                         PUSHL   KA_UNIT_NO
                        01  DD  01B3                         PUSHL   #$ER
                                01B5         ;;; TEST 4, SUBTEST 1, ERROR 1
        000100D0 9F     05  FB  01B5                         CALLS   #$$M, @#DS$ERRHARD
     07 0000003C'EF     08  E1  01BC  1483         BBC      #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                01C4  1484         $DS_ABORT
        00010020 9F     6C  FA  01C4                         CALLG   (AP), @#DS$ABORT
                                01CB  1485 10$:    $DS_CLRVEC_S    VECTOR=#SCB$L_CHMU
              0000004C 8F   DD  01CB                         PUSHL   #SCB$L_CHMU
        00010168 9F     01  FB  01D1                         CALLS   #1, @#DS$CLRVEC
                                01D8  1486         $DS_ENDSUB
                                01D8         T4_S1_X:
 00010038 9F  00000054'EF   FA  01D8                         CALLG   $S$, @#DS$ENDSUB
                                01E3  1487         $DS_PAGE
                                01E3             .SBTTL  SUBTEST 4.2:  CHMS inst. with vector service on IS
                                01E3   1490 ;+
                                01E3   1491 ; Subtest description:
                                01E3   1492 ;
                                01E3   1493 ;        This subtest checks that a CHMS instruction with the SCB vector entry
                                01E3   1494 ;        <1:0>=1 specifying service on the interrupt stack will cause
                                01E3   1495 ;        the processor to HALT (code = B).
                                01E3   1496 ;
                                01E3   1497 ; Subtest steps:
                                01E3   1498 ;
                                01E3   1499 ;        SUBTEST CHMS instruction with vector service on IS
                                01E3   1500 ;        :  Initialize Flags
                                01E3   1501 ;        :  Get interval timer vector to prevent outside interrupts
                                01E3   1502 ;        :  Get CHMS vector specifying service on IS
                                01E3   1503 ;        :  Setup code to set done flag at loc 100
                                01E3   1504 ;        :  Setup code to jump to RENTRY point in next loc
                                01E3   1505 ;        :  Print restart instructions to operator
                                01E3   1506 ;        :  Set ready to execute flag
                                01E3   1507 ;        :  Execute CHMS to cause processor to HALT
                                01E3   1508 ;        :  (this should cause a CHMS service on interrupt stack HALT)
                                01E3   1509 ;        :  IF CHMS does not caues an exception
                                01E3   1510 ;        :  :  THEN
                                01E3   1511 ;        :  :  Set exception error flag
                                01E3   1512 ;        :  ENDIF
                                01E3   1513 ;        :  RENTRY point (restart enters here from exception)
                                01E3   1514 ;        :  IF exception error flag set
                                01E3   1515 ;        :  :  THEN
                                01E3   1516 ;        :  :  Report CHMS exception error
                                01E3   1517 ;        :  :  Exit test
                                01E3   1518 ;        :  ENDIF
                                01E3   1519 ;        :  IF CHMS instruction executed flag set
                                01E3   1520 ;        :  :  THEN
                                01E3   1521 ;        :  :  Report change mode error
                                01E3   1522 ;        :  :  Exit test
                                01E3   1523 ;        :  ENDIF
                                01E3   1524 ;        :  IF done flag not set
                                01E3   1525 ;        :  :  THEN
                                01E3   1526 ;        :  :  Report done error
                                01E3   1527 ;        :  :  Exit test
                                01E3   1528 ;        :  ENDIF
                                01E3   1529 ;        :  Read PSL
                                01E3   1530 ;        :  IF IS not clear
                                01E3   1531 ;        :  :  THEN
                                01E3   1532 ;        :  :  Report incorrect stack error in clean up
                                01E3   1533 ;        :  :  Exit test
                                01E3   1534 ;        :  ENDIF
                                01E3   1535 ;        :  Release interval timer vector
                                01E3   1536 ;        :  Release CHMS vector
                                01E3   1537 ;        ENDSUBTEST CHMS instruction with
                                01E3   1538 ;
                                01E3   1539 ;-
                                01E3   1540          $DS_BGNSUB
                                01E3          T4_S2::
    00010030 9F   00000060'EF  FA   01E3                   CALLG   $S$, @#DS$BGNSUB
                  00000BC6'EF  16   01EE   1541          JSB     CLEAR_BUFFER            ; clear data buffers
                  0000003C'EF  D4   01F4   1542          CLRL    L_FLAGS                 ; initialize flags
                                01FA   1543 1$:      $DS_SETVEC_S    VECTOR=#SCB$L_CHMS,SRVADR=CHMX_SERVICE,CODE=#1
```

```
                          01    DD  01FA                 PUSHL    #1
                 00000C5C'EF    DF  01FC                 PUSHAL   CHMX_SERVICE
                 00000048 8F    DD  0202                 PUSHL    #SCB$L_CHMS
           00010160 9F    03    FB  0208                 CALLS    #3, @#DS$SETVEC
                                    020F   1544
00000100'EF      00000040'EF    7D  020F   1545 3$:      MOVQ     JUMP,RESTART           ; setup code to renter after halt
00000108'EF      00000048'EF    7D  021A   1546          MOVQ     JUMP+8,RESTART+8       ; load rest of rentry code
00000004'EF      0000029F'EF    DE  0225   1547          MOVAL    RENTRY16,RENTRY_POINT  ; load rentry address
                                    0230   1548 4$:      $DS_PRINTF_S     FORMAT=T_INSTRUCTIONS,P0=#CODE_0B,P1=#6$
                 00000296'8F    DD  0230                 PUSHL    #6$
                          0B    DD  0236                 PUSHL    #CODE_0B
                 00000085'EF    9F  0238                 PUSHAB   T_INSTRUCTIONS
           000100F0 9F    03    FB  023E                 CALLS    #$$N, @#DS$PRINTF
                                    0245   1549          $DS_PRINTF_S     FORMAT=T_CONTINUE
                 000000C3'EF    9F  0245                 PUSHAB   T_CONTINUE
           000100F0 9F    01    FB  024B                 CALLS    #$$N, @#DS$PRINTF
00000020'EF      00000000'EF    D0  0252   1550 5$:      MOVL     L_ISP,L_CUR_ISP        ; save current IS SP
00000000'EF      00000000'EF    D0  025D   1551          MOVL     L_KSP,L_EXP_SP         ; load expected SP
00000000'EF      00000000'EF    D0  0268   1552          MOVL     L_KSP,L_EXP_KSP        ; load expected KSP
00000000'EF      00000000'EF    D0  0273   1553          MOVL     L_ISP,L_EXP_ISP        ; load expected ISP
00000000'EF      0000095D'EF    D0  027E   1554          MOVL     DATA_1,L_EXP_PSL       ; load expected PSL
                 00000BDE'EF    16  0289   1555          JSB      LOAD_GPR               ; load GPR's with data
           0000003C'EF    01    C8  028F   1556          BISL2    #M_READY,L_FLAGS       ; set ready to execute flag
                          00    BE  0296   1557 6$:      CHMS     #0                     ; execute change mode instruction
           0000003C'EF    04    C8  0298   1558          BISL2    #M_EXECUTE_ERR,L_FLAGS ; if no exception occurs will get here
                                    029F   1559 RENTRY16:                                ; will renter here when completed
       1C 00000000'EF     1A    E1  029F   1560          BBC      #PSL$V_IS,L_ACT_PSL,9$ ; br = not on IS as expected
          5E     00000020'EF    D0  02A7   1561          MOVL     L_CUR_ISP,SP           ; reset IS SP
          6E     000002B6'8F    D0  02AE   1562          MOVL     #7$,(SP)               ; setup return address
                                02  02B5   1563          REI                             ; get off interrupt stack
                          0B    11  02B6   1564 7$:      BRB      9$                     ; skip IPR load
00000000'8F      00000020'EF    DA  02B8   1565 8$:      MTPR     L_CUR_ISP,#PR$_ISP     ; load IS SP into IPR
                 00000C85'EF    16  02C3   1566 9$:      JSB      ERROR_CHECK            ; check for errors (GPR's,AP,FP,PSL)
       2C 0000003C'EF     0C    E1  02C9   1567          BBC      #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                    02D1   1568          $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_CHMSSCB_ERR
                 00000428'8F    DD  02D1                 PUSHL    #T_CHMSSCB_ERR
                 00000969'EF    DF  02D7                 PUSHAL   ERR_MESSAGE
                          00    DD  02DD                 PUSHL    #0
                 00000000'EF    DD  02DF                 PUSHL    KA_UNIT_NO
                          01    DD  02E5                 PUSHL    #$ER
                                    02E7        ;;; TEST 4, SUBTEST 2, ERROR 1
           000100D0 9F    05    FB  02E7                 CALLS    #$$M, @#DS$ERRHARD
       07 0000003C'EF     08    E1  02EE   1569          BBC      #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                    02F6   1570          $DS_ABORT
           00010020 9F    6C    FA  02F6                 CALLG    (AP), @#DS$ABORT
                                    02FD   1571 10$:     $DS_CLRVEC_S     VECTOR=#SCB$L_CHMS
                 00000048 8F    DD  02FD                 PUSHL    #SCB$L_CHMS
           00010168 9F    01    FB  0303                 CALLS    #1, @#DS$CLRVEC
                                    030A   1572          $DS_ENDSUB
                                    030A        T4_S2_X:
00010038 9F      00000060'EF    FA  030A                 CALLG    $S$, @#DS$ENDSUB
                                    0315   1573          $DS_PAGE
```

```
                                                        M 4
ZZ-ENKAX-1.3    SUBTEST 4.3:  CHME inst. with vector ser        3-AUG-1983          Fiche 2  Frame M4          Sequence 257
ENKAXD                      VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:43:40  VAX-11 Macro V03-00          Page  49
1-3                         SUBTEST 4.3:  CHME inst. with vector ser  3-AUG-1983 09:57:17  WRKD$0:[PAN.ENKAX]ENKAXD.MAR;75  (18)

                                       0315              .SBTTL  SUBTEST 4.3:  CHME inst. with vector service on IS
                                       0315  1576 ;+
                                       0315  1577 ; Subtest description:
                                       0315  1578 ;
                                       0315  1579 ;          This subtest checks that a CHME instruction with the SCB vector entry
                                       0315  1580 ;          <1:0>=1 specifying service on the interrupt stack will cause
                                       0315  1581 ;          the processor to HALT (code = B).
                                       0315  1582 ;
                                       0315  1583 ; Subtest steps:
                                       0315  1584 ;
                                       0315  1585 ;          SUBTEST CHME instruction with vector service on IS
                                       0315  1586 ;          :  Initialize Flags
                                       0315  1587 ;          :  Get interval timer vector to prevent outside interrupts
                                       0315  1588 ;          :  Get CHME vector specifying service on IS
                                       0315  1589 ;          :  Setup code to set done flag at loc 100
                                       0315  1590 ;          :  Setup code to jump to RENTRY point in next loc
                                       0315  1591 ;          :  Print restart instructions to operator
                                       0315  1592 ;          :  Set ready to execute flag
                                       0315  1593 ;          :  Execute CHME to cause processor to HALT
                                       0315  1594 ;          :  (this should cause a CHME service on interrupt stack HALT)
                                       0315  1595 ;          :  IF CHME does not caues an exception
                                       0315  1596 ;          :  :  THEN
                                       0315  1597 ;          :  :  Set exception error flag
                                       0315  1598 ;          :  ENDIF
                                       0315  1599 ;          :  RENTRY point (restart enters here from exception)
                                       0315  1600 ;          :  IF exception error flag set
                                       0315  1601 ;          :  :  THEN
                                       0315  1602 ;          :  :  Report CHME exception error
                                       0315  1603 ;          :  :  Exit test
                                       0315  1604 ;          :  ENDIF
                                       0315  1605 ;          :  IF CHME instruction executed flag set
                                       0315  1606 ;          :  :  THEN
                                       0315  1607 ;          :  :  Report change mode error
                                       0315  1608 ;          :  :  Exit test
                                       0315  1609 ;          :  ENDIF
                                       0315  1610 ;          :  IF done flag not set
                                       0315  1611 ;          :  :  THEN
                                       0315  1612 ;          :  :  Report done error
                                       0315  1613 ;          :  :  Exit test
                                       0315  1614 ;          :  ENDIF
                                       0315  1615 ;          :  Read PSL
                                       0315  1616 ;          :  IF IS not clear
                                       0315  1617 ;          :  :  THEN
                                       0315  1618 ;          :  :  Report incorrect stack error in clean up
                                       0315  1619 ;          :  :  Exit test
                                       0315  1620 ;          :  ENDIF
                                       0315  1621 ;          :  Release interval timer vector
                                       0315  1622 ;          :  Release CHME vector
                                       0315  1623 ;          ENDSUBTEST CHME instruction with
                                       0315  1624 ;
                                       0315  1625 ;-
                                       0315  1626            $DS_BGNSUB
                                       0315            T4_S3::
    00010030 9F     0000006C'EF    FA  0315                         CALLG   $S$, @#DS$BGNSUB
                    00000BC6'EF    16  0320  1627          JSB      CLEAR_BUFFER             ; clear data buffers
                    0000003C'EF    D4  0326  1628          CLRL     L_FLAGS                  ; initialize flags
                                       032C  1629 1$:      $DS_SETVEC_S    VECTOR=#SCB$L_CHME,SRVADR=CHMX_SERVICE,CODE=#1
```

```
ZZ-
ENK
Sym

$$$
$$A
$$E
$$M
$$N
$$S
$$T
$EN
$ER
$MO
$S$
$ST
$TN
ALL
A_B
A_H
A_P
BAS
BAS
BIT
BUF
B_A
CEP
CEP
CHM
CLE
COD
COD
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```

```
                         01   DD  032C                               PUSHL   #1
              00000C5C'EF     DF  032E                               PUSHAL  CHMX_SERVICE
              00000044 8F     DD  0334                               PUSHL   #SCB$L_CHME
     00010160 9F         03   FB  033A                               CALLS   #3, @#DS$SETVEC
                                  0341   1630
00000100'EF   00000040'EF     7D  0341   1631 3$:       MOVQ    JUMP,RESTART              ; setup code to renter after halt
00000108'EF   00000048'EF     7D  034C   1632           MOVQ    JUMP+8,RESTART+8          ; load rest of rentry code
00000004'EF   000003D1'EF     DE  0357   1633           MOVAL   RENTRY17,RENTRY_POINT     ; load rentry address
                                  0362   1634 4$:       $DS_PRINTF_S    FORMAT=T_INSTRUCTIONS,P0=#CODE_0B,P1=#6$
              000003C8'8F     DD  0362                               PUSHL   #6$
                         0B   DD  0368                               PUSHL   #CODE_0B
              00000085'EF     9F  036A                               PUSHAB  T_INSTRUCTIONS
     000100F0 9F         03   FB  0370                               CALLS   #$$N, @#DS$PRINTF
                                  0377   1635           $DS_PRINTF_S    FORMAT=T_CONTINUE
              000000C3'EF     9F  0377                               PUSHAB  T_CONTINUE
     000100F0 9F         01   FB  037D                               CALLS   #$$N, @#DS$PRINTF
00000020'EF   00000000'EF     D0  0384   1636 5$:       MOVL    L_ISP,L_CUR_ISP           ; save current IS SP
00000000'EF   00000000'EF     D0  038F   1637           MOVL    L_KSP,L_EXP_SP            ; load expected SP
00000000'EF   00000000'EF     D0  039A   1638           MOVL    L_KSP,L_EXP_KSP           ; load expected KSP
00000000'EF   00000000'EF     D0  03A5   1639           MOVL    L_ISP,L_EXP_ISP           ; load expected ISP
00000000'EF   0000095D'EF     D0  03B0   1640           MOVL    DATA_1,L_EXP_PSL          ; load expected PSL
              00000BDE'EF     16  03BB   1641           JSB     LOAD_GPR                  ; load GPR's with data
     0000003C'EF         01   C8  03C1   1642           BISL2   #M_READY,L_FLAGS          ; set ready to execute flag
                         00   BD  03C8   1643 6$:       CHME    #0                        ; execute change mode instruction
     0000003C'EF         04   C8  03CA   1644           BISL2   #M_EXECUTE_ERR,L_FLAGS    ; if no exception occurs will get here
                                  03D1   1645 RENTRY17:                                   ; will renter here when completed
   1C 00000000'EF        1A   E1  03D1   1646           BBC     #PSL$V_IS,L_ACT_PSL,9$    ; br = not on IS as expected
      5E      00000020'EF     D0  03D9   1647           MOVL    L_CUR_ISP,SP              ; reset IS SP
      6E      000003E8'8F     D0  03E0   1648           MOVL    #7$,(SP)                  ; setup return address
                         02       03E7   1649           REI                               ; get off interrupt stack
                    0B   11       03E8   1650 7$:       BRB     9$                        ; skip IPR load
00000000'8F   00000020'EF     DA  03EA   1651 8$:       MTPR    L_CUR_ISP,#PR$_ISP        ; load IS SP into IPR
              00000C85'EF     16  03F5   1652 9$:       JSB     ERROR_CHECK               ; check for errors (GPR's,AP,FP,PSL)
   2C 0000003C'EF        0C   E1  03FB   1653           BBC     #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                  0403   1654           $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_CHMESCB_ERR
              0000045F'8F     DD  0403                               PUSHL   #T_CHMESCB_ERR
              00000969'EF     DF  0409                               PUSHAL  ERR_MESSAGE
                         00   DD  040F                               PUSHL   #0
              00000000'EF     DD  0411                               PUSHL   KA_UNIT_NO
                         01   DD  0417                               PUSHL   #$ER
                                  0419          ;;; TEST 4, SUBTEST 3, ERROR 1
     000100D0 9F         05   FB  0419                               CALLS   #$$M, @#DS$ERRHARD
   07 0000003C'EF        08   E1  0420   1655           BBC     #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                  0428   1656           $DS_ABORT
     00010020 9F         6C   FA  0428                               CALLG   (AP), @#DS$ABORT
                                  042F   1657 10$:      $DS_CLRVEC_S    VECTOR=#SCB$L_CHME
              00000044 8F     DD  042F                               PUSHL   #SCB$L_CHME
     00010168 9F         01   FB  0435                               CALLS   #1, @#DS$CLRVEC
                                  043C   1658           $DS_ENDSUB
                                  043C          T4_S3_X:
00010038 9F   0000006C'EF     FA  043C                               CALLG   $S$, @#DS$ENDSUB
                                  0447   1659           $DS_PAGE
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                          0447            .SBTTL  SUBTEST 4.4:  CHMK inst. with vector service on IS
                          0447  1662 ;+
                          0447  1663 ; Subtest description:
                          0447  1664 ;
                          0447  1665 ;        This subtest checks that a CHMK instruction with the SCB vector entry
                          0447  1666 ;        <1:0>=1 specifying service on the interrupt stack will cause
                          0447  1667 ;        the processor to HALT (code = B).
                          0447  1668 ;
                          0447  1669 ; Subtest steps:
                          0447  1670 ;
                          0447  1671 ;        SUBTEST CHMK instruction with vector service on IS
                          0447  1672 ;        :  Initialize Flags
                          0447  1673 ;        :  Get interval timer vector to prevent outside interrupts
                          0447  1674 ;        :  Get CHMK vector specifying service on IS
                          0447  1675 ;        :  Setup code to set done flag at loc 100
                          0447  1676 ;        :  Setup code to jump to RENTRY point in next loc
                          0447  1677 ;        :  Print restart instructions to operator
                          0447  1678 ;        :  Set ready to execute flag
                          0447  1679 ;        :  Execute CHMK to cause processor to HALT
                          0447  1680 ;        :  (this should cause a CHMK service on interrupt stack HALT)
                          0447  1681 ;        :  IF CHMK does not caues an exception
                          0447  1682 ;        :  :  THEN
                          0447  1683 ;        :  :  Set exception error flag
                          0447  1684 ;        :  ENDIF
                          0447  1685 ;        :  RENTRY point (restart enters here from exception)
                          0447  1686 ;        :  IF exception error flag set
                          0447  1687 ;        :  :  THEN
                          0447  1688 ;        :  :  Report CHMK exception error
                          0447  1689 ;        :  :  Exit test
                          0447  1690 ;        :  ENDIF
                          0447  1691 ;        :  IF CHMK instruction executed flag set
                          0447  1692 ;        :  :  THEN
                          0447  1693 ;        :  :  Report change mode error
                          0447  1694 ;        :  :  Exit test
                          0447  1695 ;        :  ENDIF
                          0447  1696 ;        :  IF done flag not set
                          0447  1697 ;        :  :  THEN
                          0447  1698 ;        :  :  Report done error
                          0447  1699 ;        :  :  Exit test
                          0447  1700 ;        :  ENDIF
                          0447  1701 ;        :  Read PSL
                          0447  1702 ;        :  IF IS not clear
                          0447  1703 ;        :  :  THEN
                          0447  1704 ;        :  :  Report incorrect stack error in clean up
                          0447  1705 ;        :  :  Exit test
                          0447  1706 ;        :  ENDIF
                          0447  1707 ;        :  Release interval timer vector
                          0447  1708 ;        :  Release CHMK vector
                          0447  1709 ;        ENDSUBTEST CHMK instruction with
                          0447  1710 ;
                          0447  1711 ;-
                          0447  1712          $DS_BGNSUB
                          0447          T4_S4::
  00010030 9F   00000078'EF  FA  0447                  CALLG   $S$, @#DS$BGNSUB
                00000BC6'EF  16  0452  1713          JSB     CLEAR_BUFFER             ; clear data buffers
                0000003C'EF  D4  0458  1714          CLRL    L_FLAGS                  ; initialize flags
                                 045E  1715 1$:      $DS_SETVEC_S    VECTOR=#SCB$L_CHMK,SRVADR=CHMX_SERVICE,CODE=#0
```

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ZZ-EN
ENKAX
Symbo

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ERR$
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ERR$
ERR$
ERR$
ERR$
ERRO
ERR_
GPR_
HALT
IPR
JUMP
KA_P
KA_U
LDPC
LOAD
L_AC
L_AC
L_AC
L_AC
L_AD
L_CO
L_CU
L_CU
L_EX
L_EX
L_EX
L_EX
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L_EX
L_FL
L_IS
L_KA
L_KS
L_NX
L_OL
L_PA
L_PA
L_PA
L_PA
L_TE
MANU
MCHK
MEM
MM_M
MODE
MSG_
MSG_
M_BA
M_BA
M_CH
M_DO
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                     00    DD  045E                          PUSHL    #0
           00000C5C'EF     DF  0460                          PUSHAL   CHMX_SERVICE
           00000040 8F     DD  0466                          PUSHL    #SCB$L_CHMK
      00010160 9F     03   FB  046C                          CALLS    #3, @#DS$SETVEC
                               0473   1716
  00000100'EF   00000040'EF   7D  0473   1717 3$:     MOVQ     JUMP,RESTART                 ; setup code to renter after halt
  00000108'EF   00000048'EF   7D  047E   1718         MOVQ     JUMP+8,RESTART+8             ; load rest of rentry code
  00000004'EF   00000520'EF   DE  0489   1719         MOVAL    RENTRY18,RENTRY_POINT        ; load rentry address
                               0494   1720 4$:        $DS_PRINTF_S     FORMAT=T_INSTRUCTIONS,P0=#CODE_0B,P1=#6$
           00000517'8F     DD  0494                          PUSHL    #6$
                     0B    DD  049A                          PUSHL    #CODE_0B
           00000085'EF     9F  049C                          PUSHAB   T_INSTRUCTIONS
      000100F0 9F     03   FB  04A2                          CALLS    #$$N, @#DS$PRINTF
                               04A9   1721            $DS_PRINTF_S     FORMAT=T_CONTINUE
           000000C3'EF     9F  04A9                          PUSHAB   T_CONTINUE
      000100F0 9F     01   FB  04AF                          CALLS    #$$N, @#DS$PRINTF
  00000020'EF   00000000'EF   D0  04B6   1722 5$:     MOVL     L_ISP,L_CUR_ISP              ; save current IS SP
  00000000'EF   00000000'EF   D0  04C1   1723         MOVL     L_KSP,L_EXP_SP               ; load expected SP
  00000000'EF   00000000'EF   D0  04CC   1724         MOVL     L_KSP,L_EXP_KSP              ; load expected KSP
  00000000'EF   00000000'EF   D0  04D7   1725         MOVL     L_ISP,L_EXP_ISP              ; load expected ISP
  00000000'EF   0000095D'EF   D0  04E2   1726         MOVL     DATA_1,L_EXP_PSL             ; load expected PSL
                00000BDE'EF   16  04ED   1727         JSB      LOAD_GPR                     ; load GPR's with data
  00000034'EF   00000000'8F   DB  04F3   1728         MFPR     #PR$_SCBB,L_TEMP             ; load SCB base
  00000034'EF   00000040 8F   C0  04FE   1729         ADDL2    #SCB$L_CHMK,L_TEMP           ; offset of CHMK vector
           00000034'FF     01   C8  0509   1730         BISL2    #1,@L_TEMP                   ; set service on inter. stack
           0000003C'EF     01   C8  0510   1731         BISL2    #M_READY,L_FLAGS             ; set ready to execute flag
                           00   BC  0517   1732 6$:     CHMK     #0                           ; execute change mode instruction
           0000003C'EF     04   C8  0519   1733         BISL2    #M_EXECUTE_ERR,L_FLAGS       ; if no exception occurs will get here
                                    0520   1734 RENTRY18:                                     ; will renter here when completed
           00000034'FF     01   CA  0520   1735         BICL2    #1,@L_TEMP                   ; set service on inter. stack
        1C 00000000'EF     1A   E1  0527   1736         BBC      #PSL$V_IS,L_ACT_PSL,9$       ; br = not on IS as expected
        5E   00000020'EF        D0  052F   1737         MOVL     L_CUR_ISP,SP                 ; reset IS SP
        6E   0000053E'8F        D0  0536   1738         MOVL     #7$,(SP)                     ; setup return address
                           02   053D   1739             REI                                   ; get off interrupt stack
                     0B    11   053E   1740 7$:         BRB      9$                           ; skip IPR load
  00000000'8F   00000020'EF   DA  0540   1741 8$:     MTPR     L_CUR_ISP,#PR$_ISP           ; load IS SP into IPR
                00000C85'EF   16  054B   1742 9$:     JSB      ERROR_CHECK                  ; check for errors (GPR's,AP,FP,PSL)
        2C 0000003C'EF     0C   E1  0551   1743         BBC      #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                    0559   1744         $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_CHMKSCB_ERR
           00000496'8F     DD  0559                          PUSHL    #T_CHMKSCB_ERR
           00000969'EF     DF  055F                          PUSHAL   ERR_MESSAGE
                     00    DD  0565                          PUSHL    #0
           00000000'EF     DD  0567                          PUSHL    KA_UNIT_NO
                     01    DD  056D                          PUSHL    #$ER
                               056F              ;;; TEST 4, SUBTEST 4, ERROR 1
      000100D0 9F     05   FB  056F                          CALLS    #$$M, @#DS$ERRHARD
        07 0000003C'EF     08   E1  0576   1745         BBC      #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                    057E   1746         $DS_ABORT
      00010020 9F     6C   FA  057E                          CALLG    (AP), @#DS$ABORT
                               0585   1747 10$:       $DS_CLRVEC_S     VECTOR=#SCB$L_CHMK
           00000040 8F     DD  0585                          PUSHL    #SCB$L_CHMK
      00010168 9F     01   FB  058B                          CALLS    #1, @#DS$CLRVEC
                               0592   1748            $DS_ENDSUB
                               0592              T4_S4_X:
  00010038 9F   00000078'EF   FA  0592                          CALLG    $S$, @#DS$ENDSUB
                               059D   1749            $DS_PAGE
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Symb

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                                   059D                 .SBTTL  SUBTEST 4.5:  Invalid vector HALT
                                   059D  1752 ;+
                                   059D  1753 ; Subtest description:
                                   059D  1754 ;
                                   059D  1755 ;         This subtest checks that an XFC instruction with the SCB vector entry
                                   059D  1756 ;         <1:0>=3 specifying an invalid vector will cause the processor to HALT
                                   059D  1757 ;         (code = 7).
                                   059D  1758 ;
                                   059D  1759 ; Subtest steps:
                                   059D  1760 ;
                                   059D  1761 ;         SUBTEST Invalid vector HALT
                                   059D  1762 ;         :  Initialize Flags
                                   059D  1763 ;         :  Get interval timer vector to prevent outside interrupts
                                   059D  1764 ;         :  Get XFC vector bits <1:0> = 3 (invalid vector)
                                   059D  1765 ;         :  Setup code to set done flag at loc 100
                                   059D  1766 ;         :  Setup code to jump to RENTRY point in next loc
                                   059D  1767 ;         :  Print restart instructions to operator
                                   059D  1768 ;         :  Set ready to execute flag
                                   059D  1769 ;         :  Execute XFC to cause processor to HALT
                                   059D  1770 ;         :  (this should cause a invalid vector HALT)
                                   059D  1771 ;         :  IF XFC does not caues an exception
                                   059D  1772 ;         :  :  THEN
                                   059D  1773 ;         :  :  Set exception error flag
                                   059D  1774 ;         :  ENDIF
                                   059D  1775 ;         :  RENTRY point (restart enters here from exception)
                                   059D  1776 ;         :  IF exception error flag set
                                   059D  1777 ;         :  :  THEN
                                   059D  1778 ;         :  :  Report XFC exception error
                                   059D  1779 ;         :  :  Exit test
                                   059D  1780 ;         :  ENDIF
                                   059D  1781 ;         :  IF XFC instruction executed flag set
                                   059D  1782 ;         :  :  THEN
                                   059D  1783 ;         :  :  Report XFC error
                                   059D  1784 ;         :  :  Exit test
                                   059D  1785 ;         :  ENDIF
                                   059D  1786 ;         :  IF done flag not set
                                   059D  1787 ;         :  :  THEN
                                   059D  1788 ;         :  :  Report done error
                                   059D  1789 ;         :  :  Exit test
                                   059D  1790 ;         :  ENDIF
                                   059D  1791 ;         :  Read PSL
                                   059D  1792 ;         :  IF IS not clear
                                   059D  1793 ;         :  :  THEN
                                   059D  1794 ;         :  :  Report incorrect stack error in clean up
                                   059D  1795 ;         :  :  Exit test
                                   059D  1796 ;         :  ENDIF
                                   059D  1797 ;         :  Release interval timer vector
                                   059D  1798 ;         :  Release XFC vector
                                   059D  1799 ;         ENDSUBTEST Invalid vector HALT
                                   059D  1800 ;
                                   059D  1801 ;-
                                   059D  1802           $DS_BGNSUB
                                   059D         T4_S5::
   00010030 9F   00000084'EF  FA   059D                        CALLG   $S$, @#DS$BGNSUB
                 00000BC6'EF  16   05A8  1803           JSB     CLEAR_BUFFER              ; clear data buffers
                 0000003C'EF  D4   05AE  1804           CLRL    L_FLAGS                   ; initialize flags
                                   05B4  1805           $DS_SETVEC_S    VECTOR=#SCB$L_OPCCUS,SRVADR=XFC_ERROR,CODE=#3
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                     03   DD  05B4                           PUSHL    #3
            00000C6C'EF   DF  05B6                           PUSHAL   XFC_ERROR
                     14   DD  05BC                           PUSHL    #SCB$L_OPCCUS
        00010160 9F  03   FB  05BE                           CALLS    #3, @#DS$SETVEC
 00000100'EF   00000040'EF   7D  05C5   1806 3$:      MOVQ      JUMP,RESTART              ; setup code to renter after halt
 00000108'EF   00000048'EF   7D  05D0   1807          MOVQ      JUMP+8,RESTART+8          ; load rest of rentry code
 00000004'EF   00000649'EF   DE  05DB   1808          MOVAL     RENTRY19,RENTRY_POINT     ; load rentry address
                                 05E6   1809 4$:      $DS_PRINTF_S     FORMAT=T_INSTRUCTIONS,P0=#CODE_07,P1=#6$
               00000641'8F   DD  05E6                          PUSHL    #6$
                        07   DD  05EC                          PUSHL    #CODE_07
               00000085'EF   9F  05EE                          PUSHAB   T_INSTRUCTIONS
           000100F0 9F  03   FB  05F4                          CALLS    #$$N, @#DS$PRINTF
                                 05FB   1810          $DS_PRINTF_S     FORMAT=T_CONTINUE
               000000C3'EF   9F  05FB                          PUSHAB   T_CONTINUE
           000100F0 9F  01   FB  0601                          CALLS    #$$N, @#DS$PRINTF
 00000000'EF   00000000'EF   D0  0608   1811 5$:      MOVL      L_KSP,L_EXP_SP            ; load expected SP
 00000000'EF   00000000'EF   D0  0613   1812          MOVL      L_KSP,L_EXP_KSP           ; load expected KSP
 00000000'EF   00000000'EF   D0  061E   1813          MOVL      L_ISP,L_EXP_ISP           ; load expected ISP
 00000000'EF   0000095D'EF   D0  0629   1814          MOVL      DATA_1,L_EXP_PSL          ; load expected PSL
               00000BDE'EF   16  0634   1815          JSB       LOAD_GPR                  ; load GPR's with data
           0000003C'EF  01   C8  063A   1816          BISL2     #M_READY,L_FLAGS          ; set ready to execute flag
                             FC  0641   1817 6$:      XFC                                 ; execute XFC to cause exception
           0000003C'EF  04   C8  0642   1818          BISL2     #M_EXECUTE_ERR,L_FLAGS    ; if no exception occurs will get here
                                 0649   1819 RENTRY19:
           5E  00000000'EF   D0  0649   1820 9$:      MOVL      L_KSP,SP                  ; restore SP
               00000C85'EF   16  0650   1821          JSB       ERROR_CHECK               ; check for errors (GPR's,AP,FP,PSL)
        2C 0000003C'EF  0C   E1  0656   1822          BBC       #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                 065E   1823          $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_SCB_ERR
               0000032D'8F   DD  065E                          PUSHL    #T_SCB_ERR
               00000969'EF   DF  0664                          PUSHAL   ERR_MESSAGE
                        00   DD  066A                          PUSHL    #0
               00000000'EF   DD  066C                          PUSHL    KA_UNIT_NO
                        01   DD  0672                          PUSHL    #$ER
                                 0674          ;;; TEST 4, SUBTEST 5, ERROR 1
           000100D0 9F  05   FB  0674                          CALLS    #$$M, @#DS$ERRHARD
        07 0000003C'EF  08   E1  067B   1824          BBC       #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                 0683   1825          $DS_ABORT
           00010020 9F  6C   FA  0683                          CALLG    (AP), @#DS$ABORT
                                 068A   1826 10$:     $DS_CLRVEC_S     VECTOR=#SCB$L_OPCCUS
                        14   DD  068A                          PUSHL    #SCB$L_OPCCUS
           00010168 9F  01   FB  068C                          CALLS    #1, @#DS$CLRVEC
                                 0693   1827          $DS_ENDSUB
                                 0693          T4_S5_X:
 00010038 9F   00000084'EF   FA  0693                          CALLG    $S$, @#DS$ENDSUB
                                 069E   1828          $DS_PAGE
```

```
                                069E            .SBTTL  SUBTEST 4.6:  SCBB read error HALT
                                069E  1831 ;+
                                069E  1832 ; Subtest description:
                                069E  1833 ;
                                069E  1834 ;        This subtest checks that if the SCBB points to NXM, when an exception
                                069E  1835 ;        occurs the processor will HALT  (code = C).
                                069E  1836 ;
                                069E  1837 ; Subtest steps:
                                069E  1838 ;
                                069E  1839 ;        SUBTEST SCBB read error HALT
                                069E  1840 ;        :  Initialize Flags
                                069E  1841 ;        :  Get interval timer vector to prevent outside interrupts
                                069E  1842 ;        :  Get XFC vector
                                069E  1843 ;        :  Point SCBB to NXM
                                069E  1844 ;        :  Setup code to set done flag at loc 100
                                069E  1845 ;        :  Setup code to jump to RENTRY point in next loc
                                069E  1846 ;        :  Print restart instructions to operator
                                069E  1847 ;        :  Set ready to execute flag
                                069E  1848 ;        :  Execute XFC to cause processor to HALT
                                069E  1849 ;        :  (this should cause an SCBB read error HALT)
                                069E  1850 ;        :  IF XFC does not caues an exception
                                069E  1851 ;        :  :  THEN
                                069E  1852 ;        :  :  Set exception error flag
                                069E  1853 ;        :  ENDIF
                                069E  1854 ;        :  RENTRY point (restart enters here from exception)
                                069E  1855 ;        :  IF exception error flag set
                                069E  1856 ;        :  :  THEN
                                069E  1857 ;        :  :  Report XFC exception error
                                069E  1858 ;        :  :  Exit test
                                069E  1859 ;        :  ENDIF
                                069E  1860 ;        :  IF XFC instruction executed flag set
                                069E  1861 ;        :  :  THEN
                                069E  1862 ;        :  :  Report SCBB error
                                069E  1863 ;        :  :  Exit test
                                069E  1864 ;        :  ENDIF
                                069E  1865 ;        :  IF done flag not set
                                069E  1866 ;        :  :  THEN
                                069E  1867 ;        :  :  Report done error
                                069E  1868 ;        :  :  Exit test
                                069E  1869 ;        :  ENDIF
                                069E  1870 ;        :  Read PSL
                                069E  1871 ;        :  IF IS not clear
                                069E  1872 ;        :  :  THEN
                                069E  1873 ;        :  :  Report incorrect stack error in clean up
                                069E  1874 ;        :  :  Exit test
                                069E  1875 ;        :  ENDIF
                                069E  1876 ;        :  Release interval timer vector
                                069E  1877 ;        :  Release XFC vector
                                069E  1878 ;        ENDSUBTEST SCBB read error HALT
                                069E  1879 ;
                                069E  1880 ;-
                                069E  1881
                                069E  1882              $DS_BGNSUB
                                069E           T4_S6::
  00010030 9F   00000090'EF  FA 069E                    CALLG   $S$, @#DS$BGNSUB
                00000BC6'EF  16 06A9  1883      JSB     CLEAR_BUFFER                    ; clear data buffers
                0000003C'EF  D4 06AF  1884      CLRL    L_FLAGS                         ; initialize flags
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$$$


$$A
$$E


$$M


$$N


$$S


$$T
$EN
$ER
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```
                                06B5  1885 1$:      $DS_SETVEC_S     VECTOR=#SCB$L_OPCCUS,SRVADR=XFC_SERVICE,CODE=#1
                        01  DD  06B5                          PUSHL    #1
              00000C78'EF   DF  06B7                          PUSHAL   XFC_SERVICE
                        14  DD  06BD                          PUSHL    #SCB$L_OPCCUS
          00010160 9F   03  FB  06BF                          CALLS    #3, @#DS$SETVEC
   00000038'EF  00000000'8F DB  06C6  1886      MFPR     #PR$_SCBB,L_CUR_SCBB      ; save SCBB
   00000100'EF  00000040'EF 7D  06D1  1887 3$:  MOVQ     JUMP,RESTART              ; setup code to renter after halt
   00000108'EF  00000048'EF 7D  06DC  1888      MOVQ     JUMP+8,RESTART+8          ; load rest of rentry code
   00000004'EF  0000075D'EF DE  06E7  1889      MOVAL    RENTRY20,RENTRY_POINT     ; load rentry address
                                06F2  1890 4$:      $DS_PRINTF_S     FORMAT=T_INSTRUCTIONS,P0=#CODE_0C,P1=#6$
              00000755'8F   DD  06F2                          PUSHL    #6$
                        0C  DD  06F8                          PUSHL    #CODE_0C
              00000085'EF   9F  06FA                          PUSHAB   T_INSTRUCTIONS
          000100F0 9F   03  FB  0700                          CALLS    #$$N, @#DS$PRINTF
                                0707  1891          $DS_PRINTF_S     FORMAT=T_CONTINUE
              000000C3'EF   9F  0707                          PUSHAB   T_CONTINUE
          000100F0 9F   01  FB  070D                          CALLS    #$$N, @#DS$PRINTF
          00000000'EF   5E  D0  0714  1892 5$:  MOVL     SP,L_EXP_SP               ; load expected SP
   00000000'EF  00000000'EF D0  071B  1893      MOVL     L_KSP,L_EXP_KSP           ; load expected KSP
   00000000'EF  00000000'EF D0  0726  1894      MOVL     L_ISP,L_EXP_ISP           ; load expected ISP
   00000000'EF  0000095D'EF D0  0731  1895      MOVL     DATA_1,L_EXP_PSL          ; load expected PSL
              00000BDE'EF   16  073C  1896      JSB      LOAD_GPR                  ; load GPR'S and read AP & FP
   00000000'8F  00500200 8F DA  0742  1897      MTPR     #L_NXM_ADR,#PR$_SCBB      ; point SCBB to NXM
          0000003C'EF   01  C8  074D  1898      BISL2    #M_READY,L_FLAGS          ; set ready to execute flag
                            01  0754  1899      NOP                                ; wait a little
                            FC  0755  1900 6$:  XFC                                ; execute XFC instruction to cause halt
          0000003C'EF   04  C8  0756  1901      BISL2    #M_EXECUTE_ERR,L_FLAGS    ; if no exception occurs will get here
                                075D  1902
                                075D  1903 RENTRY20:                               ; will renter here when completed
          5E    00000000'EF D0  075D  1904      MOVL     L_KSP,SP                  ; restore SP
   00000000'8F  00000038'EF DA  0764  1905      MTPR     L_CUR_SCBB,#PR$_SCBB      ; restore saved SCBB
              00000C85'EF   16  076F  1906 9$:  JSB      ERROR_CHECK               ; check for errors (GPR's,AP,FP,PSL)
       2C 0000003C'EF   0C  E1  0775  1907      BBC      #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                077D  1908          $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_SCBBNXM_ERR
              00000363'8F   DD  077D                          PUSHL    #T_SCBBNXM_ERR
              00000969'EF   DF  0783                          PUSHAL   ERR_MESSAGE
                        00  DD  0789                          PUSHL    #0
              00000000'EF   DD  078B                          PUSHL    KA_UNIT_NO
                        01  DD  0791                          PUSHL    #$ER
                                0793                ;;; TEST 4, SUBTEST 6, ERROR 1
          000100D0 9F   05  FB  0793                          CALLS    #$$M, @#DS$ERRHARD
       07 0000003C'EF   08  E1  079A  1909      BBC      #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                07A2  1910          $DS_ABORT
          00010020 9F   6C  FA  07A2                          CALLG    (AP), @#DS$ABORT
                                07A9  1911 10$:     $DS_CLRVEC_S     VECTOR=#SCB$L_OPCCUS
                        14  DD  07A9                          PUSHL    #SCB$L_OPCCUS
          00010168 9F   01  FB  07AB                          CALLS    #1, @#DS$CLRVEC
                                07B2  1912          $DS_ENDSUB
                                07B2                T4_S6_X:
   00010038 9F  00000090'EF FA  07B2                          CALLG    $S$, @#DS$ENDSUB
                                07BD  1913          $DS_PAGE
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```
                                        07BD                  .SBTTL  SUBTEST 4.7:  Double machine check HALT
                                        07BD       ;+
                                        07BD       ; Subtest description:
                                        07BD       ;
                                        07BD       ;        This subtest checks that a double machine check halt will be generated
                                        07BD       ;        if a second machine check occurs before a previous machine check has
                                        07BD       ;        been serviced. (code=5)
                                        07BD       ;
                                        07BD       ; Subtest steps:
                                        07BD       ;
                                        07BD       ;        SUBTEST Double machine check HALT
                                        07BD       ;        :  Initialize Flags
                                        07BD       ;        :  Get interval timer vector to prevent outside interrupts
                                        07BD       ;        :  Point machine check vector to NXM location
                                        07BD       ;        :  Setup code to set done flag at loc 100
                                        07BD       ;        :  Setup code to jump to RENTRY point in next loc
                                        07BD       ;        :  Print restart instructions to operator
                                        07BD       ;        :  Set ready to execute flag
                                        07BD       ;        :  Reference NXM to cause machine check and thus a halt
                                        07BD       ;        :  IF NXM does not cause an exception
                                        07BD       ;        :  :  THEN
                                        07BD       ;        :  :  Set exception error flag
                                        07BD       ;        :  ENDIF
                                        07BD       ;        :  RENTRY point (restart enters here from exception)
                                        07BD       ;        :  IF exception error flag set
                                        07BD       ;        :  :  THEN
                                        07BD       ;        :  :  Report NXM exception error
                                        07BD       ;        :  :  Exit test
                                        07BD       ;        :  ENDIF
                                        07BD       ;        :  IF done flag not set
                                        07BD       ;        :  :  THEN
                                        07BD       ;        :  :  Report done error
                                        07BD       ;        :  :  Exit test
                                        07BD       ;        :  ENDIF
                                        07BD       ;        :  Release machine check vector
                                        07BD       ;        :  Release interval timer vector
                                        07BD       ;        ENDSUBTEST Double machine check HALT
                                        07BD       ;
                                        07BD       ;-
                                        07BD                  $DS_BGNSUB
                                        07BD       T4_S7::
   00010030 9F    0000009C'EF     FA    07BD                          CALLG   $S$, @#DS$BGNSUB
                  00000BC6'EF     16    07C8            JSB           CLEAR_BUFFER               ; clear data buffers
                  0000003C'EF     D4    07CE            CLRL          L_FLAGS                    ; initialize flags
            54    00000000'8F     DB    07D4            MFPR          #PR$_SCBB,R4               ; load SCBB into R4
                        54   04   C0    07DB            ADDL2         #SCB$L_MACHCHK,R4          ; add m.c. vector offset
            64    00500200 8F     D0    07DE            MOVL          #L_NXM_ADR,(R4)            ; load NXM address into vector
   00000100'EF    00000040'EF     7D    07E5       3$:  MOVQ          JUMP,RESTART               ; setup code to renter after halt
   00000108'EF    00000048'EF     7D    07F0            MOVQ          JUMP+8,RESTART+8           ; load rest of rentry code
   00000004'EF    0000086F'EF     DE    07FB            MOVAL         RENTRY21,RENTRY_POINT      ; load rentry address
                                        0806       4$:  $DS_PRINTF_S  FORMAT=T_INSTRUCTIONS,P0=#CODE_05,P1=#L_NXM_ADR
                  00500200 8F     DD    0806                          PUSHL   #L_NXM_ADR
                           05     DD    080C                          PUSHL   #CODE_05
                  00000085'EF     9F    080E                          PUSHAB  T_INSTRUCTIONS
         000100F0 9F      03      FB    0814                          CALLS   #$$N, @#DS$PRINTF
                                        081B            $DS_PRINTF_S  FORMAT=T_CONTINUE
                  000000C3'EF     9F    081B                          PUSHAB  T_CONTINUE
```

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            000100F0 9F     01    FB  0821                    CALLS   #$$N, @#DS$PRINTF
00000000'EF  00000000'EF    18    C3  0828   1965 5$:         SUBL3   #^X18,L_KSP,L_EXP_SP        ; load expected SP
     00000000'EF  00000000'EF     D0  0834   1966             MOVL    L_KSP,L_EXP_KSP             ; load expected KSP
     00000000'EF  00000000'EF     D0  083F   1967             MOVL    L_ISP,L_EXP_ISP             ; load expected ISP
     00000000'EF  0000095D'EF     D0  084A   1968             MOVL    DATA_1,L_EXP_PSL            ; load expected PSL
                  00000BDE'EF     16  0855   1969             JSB     LOAD_GPR                    ; load GPR's with data
            0000003C'EF     01    C8  085B   1970             BISL2   #M_READY,L_FLAGS            ; set ready to execute flag
                  00500200 9F     D5  0862   1971 6$:         TSTL    @#L_NXM_ADR                 ; reference NXM to cause first m.c.
            0000003C'EF     04    C8  0868   1972             BISL2   #M_EXECUTE_ERR,L_FLAGS      ; set flag if no halt occurs
                                      086F   1973 RENTRY21:
            5E    00000000'EF     D0  086F   1974             MOVL    L_KSP,SP                    ; restore SP
                  00000C85'EF     16  0876   1975             JSB     ERROR_CHECK                 ; check for errors
         2C 0000003C'EF     0C    E1  087C   1976             BBC     #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                      0884   1977             $DS_ERRHARD_S    UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_DBL_MCHK_ERR
                  000004CD'8F     DD  0884                         PUSHL    #T_DBL_MCHK_ERR
                  00000969'EF     DF  088A                         PUSHAL   ERR_MESSAGE
                            00    DD  0890                         PUSHL    #0
                  00000000'EF     DD  0892                         PUSHL    KA_UNIT_NO
                            01    DD  0898                         PUSHL    #$ER
                                      089A        ;;; TEST 4, SUBTEST 7, ERROR 1
            000100D0 9F     05    FB  089A                         CALLS    #$$M, @#DS$ERRHARD
         07 0000003C'EF     08    E1  08A1   1978             BBC     #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                      08A9   1979             $DS_ABORT
            00010020 9F     6C    FA  08A9                         CALLG    (AP), @#DS$ABORT
                                      08B0   1980 10$:        $DS_CLRVEC_S     VECTOR=#SCB$L_MACHCHK
                            04    DD  08B0                         PUSHL    #SCB$L_MACHCHK
            00010168 9F     01    FB  08B2                         CALLS    #1, @#DS$CLRVEC
                                      08B9   1981             $DS_ENDSUB
                                      08B9        T4_S7_X:
      00010038 9F   0000009C'EF   FA  08B9                         CALLG    $S$, @#DS$ENDSUB
                                      08C4   1982             $DS_PAGE
```

```
                                  08C4               .SBTTL  SUBTEST 4.8:  Transfer to NXM USER WCS
                                  08C4   1985 ;+
                                  08C4   1986 ; Subtest description:
                                  08C4   1987 ;
                                  08C4   1988 ;        This subtest will attempt to cause a transfer to NXM USER WCS HALT
                                  08C4   1989 ;        by checking the p-table for a response to ''USER WCS loaded?''. If a ''no''
                                  08C4   1990 ;        response  is found then this test will execute and attempt to envoke
                                  08C4   1991 ;        microcode that has not been loaded into WCS. (code=8)
                                  08C4   1992 ;
                                  08C4   1993 ; Subtest steps:
                                  08C4   1994 ;
                                  08C4   1995 ;        SUBTEST Transfer to NXM USER WCS HALT
                                  08C4   1996 ;        :  Check p table for USER WCS not loaded
                                  08C4   1997 ;        :  IF loaded
                                  08C4   1998 ;        :  :  THEN
                                  08C4   1999 ;        :  :  Exit subtest
                                  08C4   2000 ;        :  ENDIF
                                  08C4   2001 ;        :  Initialize Flags
                                  08C4   2002 ;        :  Get interval timer vector to prevent outside interrupts
                                  08C4   2003 ;        :  Get XFC vector to service in WCS
                                  08C4   2004 ;        :  Setup code to set done flag at loc 100
                                  08C4   2005 ;        :  Setup code to jump to RENTRY point in next loc
                                  08C4   2006 ;        :  Print restart instructions to operator
                                  08C4   2007 ;        :  Set ready to execute flag
                                  08C4   2008 ;        :  Execute XFC to cause processor to HALT
                                  08C4   2009 ;        :  (this should cause a transfer to NXM USER WCS HALT)
                                  08C4   2010 ;        :  IF XFC does not caues an exception
                                  08C4   2011 ;        :  :  THEN
                                  08C4   2012 ;        :  :  Set exception error flag
                                  08C4   2013 ;        :  ENDIF
                                  08C4   2014 ;        :  RENTRY point (restart enters here from exception)
                                  08C4   2015 ;        :  IF exception error or instruction executed flags set
                                  08C4   2016 ;        :  :  THEN
                                  08C4   2017 ;        :  :  Report XFC exception error
                                  08C4   2018 ;        :  :  Exit test
                                  08C4   2019 ;        :  ENDIF
                                  08C4   2020 ;        :  IF done flag not set
                                  08C4   2021 ;        :  :  THEN
                                  08C4   2022 ;        :  :  Report done error
                                  08C4   2023 ;        :  :  Exit test
                                  08C4   2024 ;        :  ENDIF
                                  08C4   2025 ;        :  Read PSL
                                  08C4   2026 ;        :  IF IS not clear
                                  08C4   2027 ;        :  :  THEN
                                  08C4   2028 ;        :  :  Report incorrect stack error in clean up
                                  08C4   2029 ;        :  :  Exit test
                                  08C4   2030 ;        :  ENDIF
                                  08C4   2031 ;        :  Release interval timer vector
                                  08C4   2032 ;        :  Release XFC vector
                                  08C4   2033 ;        ENDSUBTEST Transfer to NXM USER WCS HALT
                                  08C4   2034 ;
                                  08C4   2035 ;-
                                  08C4   2036                $DS_BGNSUB
                                  08C4          T4_S8::
  00010030 9F    000000A8'EF   FA 08C4                      CALLG   $S$, @#DS$BGNSUB
                                  08CF   2037                                        ; check p table for WCS loaded
        03 00000000'EF    19   E1 08CF   2038                BBC     #V_USR_WCS,L_KA_FLAGS,1$ ; br = user wcs not loaded
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                                08D7  2039            $DS_EXIT        TEST                    ; exit test if user wcs loaded
                     0106   31  08D7                          BRW     TEST_004_X              ; EXIT TEST 4
            00000BC6'EF     16  08DA  2040 1$:        JSB     CLEAR_BUFFER                    ; clear data buffers
            0000003C'EF     D4  08E0  2041            CLRL    L_FLAGS                         ; initialize flags
                                08E6  2042            $DS_SETVEC_S    VECTOR=#SCB$L_OPCCUS,SRVADR=XFC_SERVICE,CODE=#2
                       02   DD  08E6                          PUSHL   #2
            00000C78'EF     DF  08E8                          PUSHAL  XFC_SERVICE
                       14   DD  08EE                          PUSHL   #SCB$L_OPCCUS
          00010160 9F  03   FB  08F0                          CALLS   #3, @#DS$SETVEC
00000100'EF 00000040'EF     7D  08F7  2043 3$:        MOVQ    JUMP,RESTART                    ; setup code to renter after halt
00000108'EF 00000048'EF     7D  0902  2044            MOVQ    JUMP+8,RESTART+8                ; load rest of rentry code
00000004'EF 0000097B'EF     DE  090D  2045            MOVAL   RENTRY22,RENTRY_POINT           ; load rentry address
                                0918  2046 4$:        $DS_PRINTF_S    FORMAT=T_INSTRUCTIONS,P0=#CODE_08,P1=#6$
            00000973'8F     DD  0918                          PUSHL   #6$
                       08   DD  091E                          PUSHL   #CODE_08
            00000085'EF     9F  0920                          PUSHAB  T_INSTRUCTIONS
          000100F0 9F  03   FB  0926                          CALLS   #$$N, @#DS$PRINTF
                                092D  2047            $DS_PRINTF_S    FORMAT=T_CONTINUE
            000000C3'EF     9F  092D                          PUSHAB  T_CONTINUE
          000100F0 9F  01   FB  0933                          CALLS   #$$N, @#DS$PRINTF
00000000'EF 00000000'EF     D0  093A  2048 5$:        MOVL    L_KSP,L_EXP_SP                  ; load expected SP
00000000'EF 00000000'EF     D0  0945  2049            MOVL    L_KSP,L_EXP_KSP                 ; load expected KSP
00000000'EF 00000000'EF     D0  0950  2050            MOVL    L_ISP,L_EXP_ISP                 ; load expected ISP
00000000'EF 0000095D'EF     D0  095B  2051            MOVL    DATA_1,L_EXP_PSL                ; load expected PSL
            00000BDE'EF     16  0966  2052            JSB     LOAD_GPR                        ; load GPR's with data
         0000003C'EF   01   C8  096C  2053            BISL2   #M_READY,L_FLAGS                ; set ready to execute flag
                            FC  0973  2054 6$:        XFC                                     ; execute XFC to cause halt
         0000003C'EF   04   C8  0974  2055            BISL2   #M_EXECUTE_ERR,L_FLAGS          ; set flag if no halt occurs
                                097B  2056 RENTRY22:
              5E 00000000'EF    D0  097B  2057            MOVL    L_KSP,SP                        ; restore SP
            00000C85'EF     16  0982  2058            JSB     ERROR_CHECK                     ; check for errors
      2C 0000003C'EF   0C   E1  0988  2059            BBC     #V_ERROR_FLAG,L_FLAGS,10$ ; br = no errors
                                0990  2060            $DS_ERRHARD_S   UNIT=KA_UNIT_NO, PRLINK=ERR_MESSAGE,P1=#T_NXM_WCS_ERR
            0000050B'8F     DD  0990                          PUSHL   #T_NXM_WCS_ERR
            00000969'EF     DF  0996                          PUSHAL  ERR_MESSAGE
                       00   DD  099C                          PUSHL   #0
            00000000'EF     DD  099E                          PUSHL   KA_UNIT_NO
                       01   DD  09A4                          PUSHL   #$ER
                                09A6          ;;; TEST 4, SUBTEST 8, ERROR 1
          000100D0 9F  05   FB  09A6                          CALLS   #$$M, @#DS$ERRHARD
      07 0000003C'EF   08   E1  09AD  2061            BBC     #V_FATAL_ERR,L_FLAGS,10$ ; br = no fatal errors
                                09B5  2062            $DS_ABORT
          00010020 9F  6C   FA  09B5                          CALLG   (AP), @#DS$ABORT
                                09BC  2063 10$:       $DS_CLRVEC_S    VECTOR=#SCB$L_OPCCUS
                       14   DD  09BC                          PUSHL   #SCB$L_OPCCUS
          00010168 9F  01   FB  09BE                          CALLS   #1, @#DS$CLRVEC
                                09C5  2064            $DS_ENDSUB
                                09C5          T4_S8_X:
00010038 9F     000000A8'EF FA  09C5                          CALLG   $S$, @#DS$ENDSUB
                                09D0  2065
                                09D0  2066            $DS_CLRVEC_S    VECTOR=#SCB$L_TIMER
            000000C0 8F     DD  09D0                          PUSHL   #SCB$L_TIMER
          00010168 9F  01   FB  09D6                          CALLS   #1, @#DS$CLRVEC
                                09DD  2067            $DS_ENDTEST
                   50  01   D0  09DD                          MOVL    #1, R0                  ; NORMAL EXIT
                                09E0          TEST_004_X::
          00010058 9F  6E   FA  09E0                          CALLG   (SP), @#DS$BREAK
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                      04  09E7                   RET                            ; RETURN TO TEST SEQUENCER
                          09E8  2068      $DS_PAGE
                          09E8  2069
                      00000000                   .PSECT  $TSTCNT, NOEXE, NOWRT, OVR, LONG
              00000004  0000                     .LONG   $TN
                          0004  2071      .END
```

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$$$                             = 000000A8 R     06        DS$BREAK                           00010058
$$ARGS                          = 0000000A                 DS$CANWAIT                         00010070
$$E                             = 00000001                 DS$CHANNEL                         00010180
$$M                             = 00000005                 DS$CKLOOP                          00010040
$$N                             = 00000001                 DS$CLRVEC                          00010168
$$S                             = FFFFFFFF                 DS$CNTRLC                          00010078
$$T1                            = 0000002C                 DS$CVTREG                          000100B0
$ENV                            = 00000001  G              DS$ENDPASS                         00010010
$ER                             = FFFFFFFF                 DS$ENDSUB                          00010038
$MO                             = 00000001  G              DS$ERRDEV                          000100C8
$S$                             = 000000A8 R     06        DS$ERRHARD                         000100D0
$ST                             = 00000000                 DS$ERRPREP                         00010108
$TN                             = 00000004                 DS$ERRSOFT                         000100D8
ALL                             = 00000008  G              DS$ERRSYS                          000100C0
A_BUFFER_BEGIN                    ********  X    04        DS$ESCAPE                          00010050
A_HALT_BUFFER                     ********  X    02        DS$FREEDBGSYM                      000101B8
A_PSLMNE                          ********  X    02        DS$GETBUF                          00010120
BASE_003                          00000000 R     04        DS$GETMEM                          00010130
BASE_004                          00000000 R     07        DS$GPHARD                          00010018
BIT...                          = 00000005                 DS$HELP                            000101B0
BUFSIZ                          = 00000080                 DS$INITSCB                         00010170
B_ANSWER                          00000000 R     02        DS$INLOOP                          00010048
CEP_FUNCTIONAL                  = 00000000                 DS$K_ERROR                       = 00000002
CEP_REPAIR                      = 00000001                 DS$K_NORMAL                      = 00000001
CHMX_SERVICE                      00000C5C R     02        DS$K_SEVERE                      = 00000004
CLEAR_BUFFER                      00000BC6 R     02        DS$K_SUBSYS                      = 00000066
CODE_00                         = 00000000                 DS$K_WARNING                     = 00000000
CODE_01                         = 00000001                 DS$LOAD                            00010198
CODE_02                         = 00000002                 DS$LOADPCS                         000101C0
CODE_03                         = 00000003                 DS$MAPDBGBLOCK                     00010118
CODE_04                         = 00000004                 DS$MMOFF                           00010158
CODE_05                         = 00000005                 DS$MMON                            00010150
CODE_06                         = 00000006                 DS$MOVPHY                          00010148
CODE_07                         = 00000007                 DS$MOVVRT                          00010140
CODE_08                         = 00000008                 DS$PARSE                           000100B8
CODE_09                         = 00000009                 DS$PRINTB                          000100E0
CODE_0A                         = 0000000A                 DS$PRINTF                          000100F0
CODE_0B                         = 0000000B                 DS$PRINTS                          000100F8
CODE_0C                         = 0000000C                 DS$PRINTSIG                        00010100
CPU$V_COMET                     = 00000002                 DS$PRINTX                          000100E8
CPU$V_HS                        = 00000000                 DS$PROBE                           000101A0
CPU$V_STAR                      = 00000001                 DS$RELBUF                          00010128
DATA_003                          00000020 R     04        DS$RELMEM                          00010138
DATA_004                          00000024 R     07        DS$SETIPL                          00010178
DATA_1                            0000095D R     02        DS$SETMAP                          00010188
DATA_2                            00000961 R     02        DS$SETPRIEXV                       00010110
DATA_3                            00000965 R     02        DS$SETVEC                          00010160
DEFAULT                         = 00000000  G              DS$SHOCHAN                         00010190
DS$ABORT                          00010020                 DS$SUMMARY                         00010028
DS$ASKADR                         00010090                 DS$WAITMS                          00010060
DS$ASKDATA                        00010080                 DS$WAITUS                          00010068
DS$ASKLGCL                        00010098                 DS$_ARITH                        = 006600D0
DS$ASKSTR                         000100A0                 DS$_BADLINK                      = 006600F0
DS$ASKVLD                         00010088                 DS$_BADTYPE                      = 006600E8
DS$ATTACH                         000101A8                 DS$_CHME                         = 006600A8
DS$BGNSUB                         00010030                 DS$_CHMK                         = 006600E0
DS$BRANCH                         000100A8                 DS$_DEVNAME                      = 00660108
```

```
DS$_ERROR                     = 00660002        DSA$M_HALT                    = 00000001
DS$_FHWE                      = 00660068        DSA$M_IE1                     = 00000010
DS$_FRAGBUF                   = 00660080        DSA$M_IE2                     = 00000020
DS$_ICBUSY                    = 006600C8        DSA$M_IE3                     = 00000040
DS$_ICERR                     = 006600C0        DSA$M_IES                     = 00000080
DS$_IHWE                      = 00660060        DSA$M_LOAD_DEBUGGER           = 40000000
DS$_ILLCHAR                   = 00660018        DSA$M_LOOP                    = 00000004
DS$_ILLPAGCNT                 = 00660078        DSA$M_NORPT                   = 08000000
DS$_ILLUNIT                   = 00660100        DSA$M_OPER                    = 00001000
DS$_INSFMEM                   = 00660050        DSA$M_PASSO                   = 20000000
DS$_IPL2HI                    = 006600B8        DSA$M_PROMPT                  = 00002000
DS$_IVADDR                    = 00660040        DSA$M_QA                      = 00008000
DS$_IVVECT                    = 00660038        DSA$M_QUICK                   = 00000100
DS$_KRNLSTK                   = 00660090        DSA$M_SEARCH                  = 00004000
DS$_LOGIC                     = 00660070        DSA$M_TRACE                   = 00000400
DS$_MCHK                      = 00660088        DSA$M_USER                    = 10000000
DS$_MMOFF                     = 00660058        DSA$M_VERIFY                  = 00000200
DS$_NEEDUNIT                  = 006600F8        DSA$V_APT                     = 0000001F
DS$_NOPCS                     = 00660110        DSA$V_BELL                    = 00000003
DS$_NORMAL                    = 00660001        DSA$V_BINARY                  = 00000001
DS$_NOSUPPORT                 = 006600B1        DSA$V_CRD_AUTOTEST            = 0000000B
DS$_NOTDON                    = 00660030        DSA$V_CRD_MENUTEST            = 00000010
DS$_NOTIMP                    = 006600B0        DSA$V_CRD_TRACE               = 00000011
DS$_NULLSTR                   = 00660010        DSA$V_DEBUG                   = 0000001A
DS$_OVERFLOW                  = 00660008        DSA$V_HALT                    = 00000000
DS$_POWER                     = 00660098        DSA$V_IE1                     = 00000004
DS$_PROGERR                   = 00660020        DSA$V_IE2                     = 00000005
DS$_SEVERE                    = 00660004        DSA$V_IE3                     = 00000006
DS$_TRANSL                    = 006600A0        DSA$V_IES                     = 00000007
DS$_TRUNCATE                  = 00660028        DSA$V_LOAD_DEBUGGER           = 0000001E
DS$_UNEXPINT                  = 006600D8        DSA$V_LOOP                    = 00000002
DS$_VASFULL                   = 00660048        DSA$V_NORPT                   = 0000001B
DS$_WARNING                   = 00660000        DSA$V_OPER                    = 0000000C
DSA$AL_APTMAIL                  0000FE00        DSA$V_PASSO                   = 0000001D
DSA$AT_APTTXT                   0000FA00        DSA$V_PROMPT                  = 0000000D
DSA$GL_APTCOM                   0000FE04        DSA$V_QA                      = 0000000F
DSA$GL_DEVLEN                   0000FE58        DSA$V_QUICK                   = 00000008
DSA$GL_ERRNO                    0000FE44        DSA$V_SEARCH                  = 0000000E
DSA$GL_EVENT                    0000FE48        DSA$V_TRACE                   = 0000000A
DSA$GL_FLAGS                    0000FE00        DSA$V_USER                    = 0000001C
DSA$GL_MSGTYP                   0000FE40        DSA$V_VERIFY                  = 00000009
DSA$GL_PASSES                   0000FE08        ENV$M_DOMAIN                  = 00000002
DSA$GL_PASSNO                   0000FE54        ENV$M_LEVEL                   = 00000001
DSA$GL_SECTNO                   0000FE10        ENV$M_SUPER                   = 000003FC
DSA$GL_SID                      0000FE14        ENV$S_DOMAIN                  = 00000001
DSA$GL_SUBTNO                   0000FE4C        ENV$S_LEVEL                   = 00000001
DSA$GL_TESTNO                   0000FE50        ENV$S_SUPER                   = 00000008
DSA$GL_UNITS                    0000FE0C        ENV$V_DOMAIN                  = 00000001
DSA$GQ_MSGPTR                   0000FE68        ENV$V_LEVEL                   = 00000000
DSA$GT_DEVNAM                   0000FE5C        ENV$V_SUPER                   = 00000002
DSA$M_APT                     = 80000000        ENV$_CPU                      = 00000000
DSA$M_BELL                    = 00000008        ENV$_FUNCTIONAL               = 00000000
DSA$M_BINARY                  = 00000002        ENV$_REPAIR                   = 00000001
DSA$M_CRD_AUTOTEST            = 00000800        ENV$_SUPER                    = 00000001
DSA$M_CRD_MENUTEST            = 00010000        ENV$_SYSTEM                   = 00000001
DSA$M_CRD_TRACE               = 00020000        ERR$_MSGADR                   = 0000000C
DSA$M_DEBUG                   = 04000000        ERR$_NARGS                    = 0000000A
```

```
ERR$_NUM            = 00000004                M_ERROR_FLAG        = 00001000
ERR$_P1             = 00000014                M_EXECUTE_ERR       = 00000004
ERR$_P2             = 00000018                M_FATAL_ERR         = 00000100
ERR$_P3             = 0000001C                M_GPR_ERR           = 00000400
ERR$_P4             = 00000020                M_ISP_ERR           = 00004000
ERR$_P5             = 00000024                M_ISTR              = 00010000
ERR$_P6             = 00000028                M_KSP_ERR           = 00002000
ERR$_POINTER        = 00000010                M_PSL_ERR           = 00000200
ERR$_UNIT           = 00000008                M_READY             = 00000001
ERROR_CHECK           00000C85 RG    02       M_SP_ERR            = 00008000
ERR_MESSAGE           00000969 R     02       M_TIMER             = 00000020
GPR_TABLE             ********    X  02       M_XFC               = 00000800
HALT                = 00000004  G             M_XFC_ERR           = 00000010
IPR                 = 00000006  G             PAR$M_ATDEF         = 00000010
JUMP                  00000040 R     02       PAR$M_ATHI          = 00000008
KA_PTABLE             ********    X  04       PAR$M_ATLO          = 00000004
KA_UNIT_NO            ********    X  04       PAR$M_NODEF         = 00000002
LDPCTX              = 0000000B  G             PAR$V_ATDEF         = 00000004
LOAD_GPR              00000BDE R     02       PAR$V_ATHI          = 00000003
L_ACT_ISP             ********    X  02       PAR$V_ATLO          = 00000002
L_ACT_KSP             ********    X  02       PAR$V_NODEF         = 00000001
L_ACT_PSL             ********    X  02       PAR$_BIN            = 00000002
L_ACT_SP              ********    X  02       PAR$_DEC            = 0000000A
L_ADDRESS             0000001C R     02       PAR$_HEX            = 00000010
L_COUNT               00000018 R     02       PAR$_NO             = 00000000
L_CUR_ISP             00000020 R     02       PAR$_OCT            = 00000008
L_CUR_SCBB            00000038 R     02       PAR$_YES            = 00000001
L_EXP_AP              ********    X  02       POWER               = 00000003  G
L_EXP_FP              ********    X  02       PR$_ISP               ********    X  02
L_EXP_ISP             ********    X  02       PR$_KSP               ********    X  02
L_EXP_KSP             ********    X  02       PR$_SCBB              ********    X  07
L_EXP_MOD             00000024 R     02       PRT$C_KR              ********    X  04
L_EXP_PSL             ********    X  02       PRT$C_KW              ********    X  04
L_EXP_SP              ********    X  02       PSL$C_EXEC          = 00000001
L_EXP_STACK           00000028 R     02       PSL$C_KERNEL        = 00000000
L_FLAGS               0000003C R     02       PSL$C_SUPER         = 00000002
L_ISP                 ********    X  04       PSL$C_USER          = 00000003
L_KA_FLAGS            ********    X  07       PSL$K_EXEC          = 00000001
L_KSP                 ********    X  04       PSL$K_KERNEL        = 00000000
L_NXM_ADR           = 00500200                PSL$K_SUPER         = 00000002
L_OLDPROT             0000002C R     02       PSL$K_USER          = 00000003
L_PAGE0END            00000014 R     02       PSL$M_C             = 00000001
L_PAGEND              0000000C R     02       PSL$M_CBIT          = 00000001
L_PAGESTRT            00000008 R     02       PSL$M_CM            = 80000000
L_PAGEZERO            00000010 R     02       PSL$M_CURMOD        = 03000000
L_TEMP                00000034 R     02       PSL$M_DV            = 00000080
MANUAL              = 00000001  G             PSL$M_FPD           = 08000000
MCHK                = 00000005  G             PSL$M_FU            = 00000040
MEM                 = 00000009  G             PSL$M_IPL           = 001F0000
MM_MSG                00000920 R     02       PSL$M_IS            = 04000000
MODELIST              ********    X  02       PSL$M_IV            = 00000020
MSG_003               00000002 R     04       PSL$M_N             = 00000008
MSG_004               00000002 R     07       PSL$M_NBIT          = 00000008
M_BAD_MODE          = 00000040                PSL$M_PRVMOD        = 00C00000
M_BAD_STK           = 00000080                PSL$M_SAFBITS       = 000037FF
M_CHMX_ERR          = 00000008                PSL$M_TBIT          = 00000010
M_DONE              = 00000002                PSL$M_TP            = 40000000
```

```
PSL$M_V                   = 00000002                SCB$L_CHMU                       0000004C
PSL$M_VBIT                = 00000002                SCB$L_COMPAT                     00000030
PSL$M_Z                   = 00000004                SCB$L_KNLSTK                     00000008
PSL$M_ZBIT                = 00000004                SCB$L_MACHCHK                    00000004
PSL$S_CURMOD              = 00000002                SCB$L_OPCCUS                     00000014
PSL$S_IPL                 = 00000005                SCB$L_OPCDEC                     00000010
PSL$S_PRVMOD              = 00000002                SCB$L_POWER                      0000000C
PSL$V_C                   = 00000000                SCB$L_RADRMOD                    0000001C
PSL$V_CBIT                = 00000000                SCB$L_ROPRAND                    00000018
PSL$V_CM                  = 0000001F                SCB$L_RXDB                       000000F8
PSL$V_CURMOD              = 00000018                SCB$L_SFTLVL1                    00000084
PSL$V_DV                  = 00000007                SCB$L_SFTLVL10                   000000A8
PSL$V_FPD                 = 0000001B                SCB$L_SFTLVL11                   000000AC
PSL$V_FU                  = 00000006                SCB$L_SFTLVL12                   000000B0
PSL$V_IPL                 = 00000010                SCB$L_SFTLVL13                   000000B4
PSL$V_IS                  = 0000001A                SCB$L_SFTLVL14                   000000B8
PSL$V_IV                  = 00000005                SCB$L_SFTLVL15                   000000BC
PSL$V_N                   = 00000003                SCB$L_SFTLVL2                    00000088
PSL$V_NBIT                = 00000003                SCB$L_SFTLVL3                    0000008C
PSL$V_PRVMOD              = 00000016                SCB$L_SFTLVL4                    00000090
PSL$V_TBIT                = 00000004                SCB$L_SFTLVL5                    00000094
PSL$V_TP                  = 0000001E                SCB$L_SFTLVL6                    00000098
PSL$V_V                   = 00000001                SCB$L_SFTLVL7                    0000009C
PSL$V_VBIT                = 00000001                SCB$L_SFTLVL8                    000000A0
PSL$V_Z                   = 00000002                SCB$L_SFTLVL9                    000000A4
PSL$V_ZBIT                = 00000002                SCB$L_TBIT                       00000028
READ_GPR                    00000C06 R     02       SCB$L_TIMER                      000000C0
REG_TABLE                   ********   X   02       SCB$L_TRANSL                     00000024
RENTRY1                     00000143 R     04       SCB$L_TXDB                       000000FC
RENTRY10                    000008A8 R     04       SCB$L_ZERO                       00000000
RENTRY11                    0000095D R     04       SEP_FUNCTIONAL                 = 00000002
RENTRY12                    00000A1C R     04       SEP_REPAIR                     = 00000003
RENTRY13                    00000AD1 R     04       SIZ...                         = 00000001
RENTRY15                    0000016D R     07       SYS$ALLOC                        00010238
RENTRY16                    0000029F R     07       SYS$ASCTIM                       00010248
RENTRY17                    000003D1 R     07       SYS$ASSIGN                       00010250
RENTRY18                    00000520 R     07       SYS$BINTIM                       00010258
RENTRY19                    00000649 R     07       SYS$CANCEL                       00010260
RENTRY2                     00000208 R     04       SYS$CANTIM                       00010268
RENTRY20                    0000075D R     07       SYS$CLOSE                        000105B8
RENTRY21                    0000086F R     07       SYS$CLREF                        00010298
RENTRY22                    0000097B R     07       SYS$CONNECT                      000105C0
RENTRY3                     00000343 R     04       SYS$DALLOC                       000102D8
RENTRY4                     00000434 R     04       SYS$DASSGN                       000102E0
RENTRY5                     00000508 R     04       SYS$DISCONNECT                   000105D0
RENTRY6                     000005C0 R     04       SYS$FAO                          00010350
RENTRY7                     00000675 R     04       SYS$FAOL                         00010358
RENTRY8                     00000734 R     04       SYS$GET                          00010580
RENTRY9                     000007E9 R     04       SYS$GETCHN                       000104C8
RENTRY_POINT                00000004 R     02       SYS$GETTIM                       00010378
RESTART                   = 00000100                SYS$LKWSET                       000103A0
SCB$L_ACCESS                00000020                SYS$NUMTIM                       000103B8
SCB$L_ARITH                 00000034                SYS$OPEN                         00010608
SCB$L_BREAK                 0000002C                SYS$QIO                          000103C8
SCB$L_CHME                  00000044                SYS$QIOW                         00010200
SCB$L_CHMK                  00000040                SYS$READ                         00010590
SCB$L_CHMS                  00000048                SYS$READEF                       000103D0
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```
SYS$SETAST                     000103F8                 T_CHMUSCB_ERR                  000003F1 R      02
SYS$SETEF                      00010400                 T_CHMU_ERR                     0000028D R      02
SYS$SETIMR                     00010420                 T_CHMX_ERR                     000005FC R      02
SYS$SETPRI                     00010428                 T_CONTINUE                     000000C3 R      02
SYS$SETPRT                     00010430   G             T_DBL_MCHK_ERR                 000004CD R      02
SYS$SETRWM                     00010438                 T_EXECUTE                      000005A2 R      02
SYS$SETSWM                     00010448                 T_EXITING                      00000114 R      02
SYS$ULKPAG                     00010460                 T_EXP_PSL                      00000863 R      02
SYS$ULWSET                     00010468                 T_GOOD_DATA                    0000079C R      02
SYS$UNWIND                     00010470                 T_GPR                          000008CA R      02
SYS$WAITFR                     00010478                 T_GPR_ERR                      0000074C R      02
SYS$WFLAND                     00010488                 T_HALT_ERR                     000001F1 R      02
SYS$WFLOR                      00010490                 T_HALT_MESS                    000001C1 R      02
T3_S1                          000000AD RG      04      T_INSTRUCTIONS                 00000085 R      02
T3_S1_X                        0000018E R       04      T_INVLDIS_ERR                  00000215 R      02
T3_S2                          00000199 RG      04      T_ISP_ERR1                     000006B6 R      02
T3_S2_X                        000003F6 R       04      T_ISP_ERR2                     000006E4 R      02
T3_S3                          00000401 RG      04      T_KSP_ERR1                     0000065A R      02
T3_S3_X                        00000576 R       04      T_KSP_ERR2                     00000688 R      02
T3_S4                          00000581 RG      04      T_NOT_DONE                     00000574 R      02
T3_S4_X                        000006E9 R       04      T_NOT_ON_IS                    0000083C R      02
T3_S5                          000006F4 RG      04      T_NOT_ON_KS                    00000818 R      02
T3_S5_X                        0000085D R       04      T_NOT_READY                    00000542 R      02
T3_S6                          00000868 RG      04      T_NOXOR                        0000090C R      02
T3_S6_X                        000009D1 R       04      T_NO_KA730                     0000004D R      02
T3_S7                          000009DC RG      04      T_NXMIS_ERR                    00000250 R      02
T3_S7_X                        00000B45 R       04      T_NXM_WCS_ERR                  0000050B R      02
T4_S1                          000000B1 RG      07      T_PAGEOPROT                    000007B7 R      02
T4_S1_X                        000001D8 R       07      T_PAGEPROT                     000007E5 R      02
T4_S2                          000001E3 RG      07      T_PSL                          000008AD R      02
T4_S2_X                        0000030A R       07      T_REST_OFF                     00000191 R      02
T4_S3                          00000315 RG      07      T_SCBBNXM_ERR                  00000363 R      02
T4_S3_X                        0000043C R       07      T_SCB_ERR                      0000032D R      02
T4_S4                          00000447 RG      07      T_SP_ERR1                      00000712 R      02
T4_S4_X                        00000592 R       07      T_SP_ERR2                      00000740 R      02
T4_S5                          0000059D RG      07      T_TIMER                        00000632 R      02
T4_S5_X                        00000693 R       07      T_WARNING                      00000129 R      02
T4_S6                          0000069E RG      07      T_WCS_ERR                      0000039F R      02
T4_S6_X                        000007B2 R       07      T_XFC                          000005C7 R      02
T4_S7                          000007BD RG      07      T_XOR                          000008F2 R      02
T4_S7_X                        000008B9 R       07      UBI                          = 0000000A   G
T4_S8                          000008C4 RG      07      V_BAD_MODE                   = 00000006
T4_S8_X                        000009C5 R       07      V_BAD_STK                    = 00000007
TEST_003                       00000024 RG      04      V_CHMX_ERR                   = 00000003
TEST_003_X                     00000B60 RG      04      V_DONE                       = 00000001
TEST_004                       00000028 RG      07      V_ERROR_FLAG                 = 0000000C
TEST_004_X                     000009E0 RG      07      V_EXECUTE_ERR                = 00000002
TIMER_SERVICE                  00000C54 R       02      V_FATAL_ERR                  = 00000008
TU58                         = 00000002   G             V_GPR_ERR                    = 0000000A
T_ACT_PSL                      00000888 R       02      V_ISP_ERR                    = 0000000E
T_BAD_DATA                     00000775 R       02      V_ISTK                       = 00000010
T_CHMESCB_ERR                  0000045F R       02      V_KSP_ERR                    = 0000000D
T_CHME_ERR                     000002DD R       02      V_MCHK_FLAG                  = 00000011
T_CHMKSCB_ERR                  00000496 R       02      V_PSL_ERR                    = 00000009
T_CHMK_ERR                     00000305 R       02      V_READY                      = 00000000
T_CHMSSCB_ERR                  00000428 R       02      V_SP_ERR                     = 0000000F
T_CHMS_ERR                     000002B5 R       02      V_TIMER                      = 00000005
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V_USR_WCS                       = 00000019
V_XFC                           = 0000000B
V_XFC_ERR                       = 00000004
WCS                             = 00000007  G
XFC_ERROR                         00000C6C R      02
XFC_SERVICE                       00000C78 R      02

                                                 +----------------+
                                                 ! Psect synopsis !
                                                 +----------------+

PSECT name                      Allocation          PSECT No.  Attributes
----------                      ----------          ---------  ----------
.  ABS  .                       00000000  (     0.)  00 (   0.)  NOPIC    USR    CON    ABS    LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
. BLANK .                       00000000  (     0.)  01 (   1.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
ENKAXD                          00000DAD  (  3501.)  02 (   2.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC LONG
$ABS$                           00010610  (67088.)  03 (   3.)  NOPIC    USR    CON    ABS    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
TEST_003                        00000B68  (  2920.)  04 (   4.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
DISPATCH                        00000030  (    48.)  05 (   5.)  NOPIC    USR    CON    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
ARGLIST                         000000B4  (   180.)  06 (   6.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC LONG
TEST_004                        000009E8  (  2536.)  07 (   7.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
$TSTCNT                         00000004  (     4.)  08 (   8.)  NOPIC    USR    OVR    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
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ZZ-ENKAX-1.3    Cross reference                 3-AUG-1983          Fiche 2  Frame F6          Sequence 276
ENKAXD                   VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:43:40  VAX-11 Macro V03-00          Page  68
Cross reference                                                    3-AUG-1983 09:57:17  WRKD$0:[PAN.ENKAX]ENKAXD.MAR;75  (23)

                                                +-------------------------+
                                                ! Symbol Cross Reference  !
                                                +-------------------------+
SYMBOL                    VALUE        DEFINITION    REFERENCES...
------                    -----        ----------    -------------
$$$                       =000000A8-R  2036  (23)      1095  (12)        1202  (13)        1309  (14)        1454  (16)
                                                       1540  (17)        1626  (18)        1712  (19)        1802  (20)
                                                       1882  (21)        1954  (22)        2036  (23)         640  (8)
                                                        748  (9)          876  (10)         987  (11)

$$ARGS                    =0000000A    84    (2)         84  (2)
$$E                       =00000001    2036  (23)      1029  (11)        1137  (12)        1244  (13)        1351  (14)
                                                       1486  (16)        1572  (17)        1658  (18)        1748  (19)
                                                       1827  (20)        1912  (21)        1981  (22)        2064  (23)
                                                        666  (8)          817  (9)          926  (10)

$$M                       =00000005    2060  (23)      1024  (11)        1107  (12)        1132  (12)        1214  (13)
                                                       1239  (13)        1321  (14)        1346  (14)        1376  (15)
                                                       1482  (16)        1568  (17)        1654  (18)        1744  (19)
                                                       1823  (20)        1908  (21)        1977  (22)        2060  (23)
                                                        575  (7)          661  (8)          755  (9)          763  (9)
                                                        779  (9)          807  (9)          813  (9)          886  (10)
                                                        921  (10)         999  (11)

$$N                       =00000001    2060  (23)      1004  (11)      #-1005  (11)        1024  (11)        1107  (12)
                                                       1112  (12)      #-1113  (12)        1132  (12)        1214  (13)
                                                       1219  (13)      #-1220  (13)        1239  (13)        1321  (14)
                                                       1326  (14)      #-1327  (14)        1346  (14)      #-1380  (15)
                                                     #-1386  (15)      #-1393  (15)        1462  (16)      #-1463  (16)
                                                       1482  (16)        1548  (17)      #-1549  (17)        1568  (17)
                                                       1634  (18)      #-1635  (18)        1654  (18)        1720  (19)
                                                     #-1721  (19)        1744  (19)        1809  (20)      #-1810  (20)
                                                       1823  (20)        1890  (21)      #-1891  (21)        1908  (21)
                                                       1963  (22)      #-1964  (22)        1977  (22)        2046  (23)
                                                     #-2047  (23)        2060  (23)       #-352  (5)        #-353  (5)
                                                      #-355  (5)        #-357  (5)        #-359  (5)        #-361  (5)
                                                      #-363  (5)          366  (5)          368  (5)          371  (5)
                                                        373  (5)          375  (5)          377  (5)          383  (5)
                                                        387  (5)          392  (5)        #-394  (5)          402  (5)
                                                        404  (5)        #-407  (5)        #-579  (7)        #-585  (7)
                                                      #-592  (7)          646  (8)        #-647  (8)          661  (8)
                                                        755  (9)          763  (9)          771  (9)        #-772  (9)
                                                        779  (9)          807  (9)          813  (9)          886  (10)
                                                        895  (10)       #-896  (10)          90  (2)          921  (10)
                                                        999  (11)

$$S                       =FFFFFFFF    2067  (23)      1033  (12)        1095  (12)        1140  (13)        1202  (13)
                                                       1247  (14)        1309  (14)        1357  (15)        1376  (15)
                                                       1403  (16)        1454  (16)        1489  (17)        1540  (17)
                                                       1575  (18)        1626  (18)        1661  (19)        1712  (19)
                                                       1751  (20)        1802  (20)        1830  (21)        1882  (21)
                                                       1915  (22)        1954  (22)        1984  (23)        2036  (23)
                                                        556  (7)          575  (7)          602  (8)          640  (8)
                                                        669  (9)          748  (9)          820  (10)         876  (10)
                                                        929  (11)         987  (11)
$$T1                      =0000002C    84    (2)         84  (2)
$ENV                      =00000001    67    (2)
$ER                       =FFFFFFFF    2067  (23)    #-1024  (11)        1095  (12)      #-1107  (12)      #-1132  (12)
                                                       1202  (13)      #-1214  (13)      #-1239  (13)        1309  (14)
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                                             #-1321    (14)   #-1346   (14)     1454   (16)   #-1482   (16)
                                               1540    (17)   #-1568   (17)     1626   (18)   #-1654   (18)
                                               1712    (19)   #-1744   (19)     1802   (20)   #-1823   (20)
                                               1882    (21)   #-1908   (21)     1954   (22)   #-1977   (22)
                                               2036    (23)   #-2060   (23)     640    (8)    #-661    (8)
                                               748     (9)    #-755    (9)    #-763    (9)    #-779    (9)
                                             #-807     (9)    #-813    (9)      876    (10)   #-886    (10)
                                             #-921     (10)     987    (11)   #-999    (11)
$MO                  =00000001    2070  (23)   2070    (23)
$S$                  =000000A8-R  2036  (23)   1029    (11)     1095   (12)     1137   (12)     1202   (13)
                                               1244    (13)     1309   (14)     1351   (14)     1454   (16)
                                               1486    (16)     1540   (17)     1572   (17)     1626   (18)
                                               1658    (18)     1712   (19)     1748   (19)     1802   (20)
                                               1827    (20)     1882   (21)     1912   (21)     1954   (22)
                                               1981    (22)     2036   (23)     2064   (23)     640    (8)
                                               666     (8)      748    (9)      817    (9)      876    (10)
                                               926     (10)     987    (11)
$ST                  =00000000    2067  (23)   1024    (11)     1029   (11)     1033   (12)     1095   (12)
                                               1107    (12)     1132   (12)     1137   (12)     1140   (13)
                                               1202    (13)     1214   (13)     1239   (13)     1244   (13)
                                               1247    (14)     1309   (14)     1321   (14)     1346   (14)
                                               1351    (14)     1353   (14)     1376   (15)     1403   (16)
                                               1454    (16)     1482   (16)     1486   (16)     1489   (17)
                                               1540    (17)     1568   (17)     1572   (17)     1575   (18)
                                               1626    (18)     1654   (18)     1658   (18)     1661   (19)
                                               1712    (19)     1744   (19)     1748   (19)     1751   (20)
                                               1802    (20)     1823   (20)     1827   (20)     1830   (21)
                                               1882    (21)     1908   (21)     1912   (21)     1915   (22)
                                               1954    (22)     1977   (22)     1981   (22)     1984   (23)
                                               2036    (23)     2060   (23)     2064   (23)     2067   (23)
                                               575     (7)      602    (8)      640    (8)      661    (8)
                                               666     (8)      669    (9)      748    (9)      755    (9)
                                               763     (9)      779    (9)      807    (9)      813    (9)
                                               817     (9)      820    (10)     876    (10)     886    (10)
                                               921     (10)     926    (10)     929    (11)     987    (11)
                                               999     (11)
$TN                  =00000004    2070  (23)   1024    (11)     1033   (12)     1107   (12)     1132   (12)
                                               1140    (13)     1214   (13)     1239   (13)     1247   (14)
                                               1321    (14)     1346   (14)     1353   (14)     1357   (15)
                                               1376    (15)     1381   (15)     1394   (15)     1403   (16)
                                               1482    (16)     1489   (17)     1568   (17)     1575   (18)
                                               1654    (18)     1661   (19)     1744   (19)     1751   (20)
                                               1823    (20)     1830   (21)     1908   (21)     1915   (22)
                                               1977    (22)     1984   (23)     2039   (23)     2060   (23)
                                               2067    (23)     2070   (23)     556    (7)      575    (7)
                                               580     (7)      593    (7)      602    (8)      661    (8)
                                               669     (9)      763    (9)      807    (9)      820    (10)
                                               886     (10)     921    (10)     929    (11)     999    (11)
ALL                  =00000008    90    (2)    1376    (15)     575    (7)
A_BUFFER_BEGIN        00000000-XR            #-773     (9)
A_HALT_BUFFER         00000000-XR            #-396     (5)      418    (6)    #-445    (6)    #-446    (6)
                                             #-508     (6)
A_PSLMNE              00000000-XR              382     (5)      386    (5)      391    (5)
BASE_003              00000000-R  556   (7)    575     (7)
BASE_004              00000000-R  1357  (15)   1376    (15)
BIT...               =00000005    88    (2)    67      (2)      83     (2)      86     (2)      87     (2)
                                               88      (2)
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                                                                 H  6
ZZ-ENKAX-1.3    Cross reference                                3-AUG-1983          Fiche 2  Frame H6          Sequence 278
ENKAXD                          VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:43:40  VAX-11 Macro V03-00          Page  70
Cross reference                                                           3-AUG-1983 09:57:17  WRKD$0:[PAN.ENKAX]ENKAXD.MAR;75  (23)

BUFSIZ                          =00000080    167     (2)    #-350     (5)     #-382     (5)     #-386     (5)     #-391     (5)
B_ANSWER                         00000000-R  95      (2)      1391    (15)      590     (7)
CEP_FUNCTIONAL                  =00000000    67      (2)
CEP_REPAIR                      =00000001    67      (2)      67      (2)
CHMX_SERVICE                     00000C5C-R  475     (6)      1099    (12)      1206    (13)      1313    (14)      1457    (16)
                                                              1543    (17)      1629    (18)      1715    (19)      991     (11)
CLEAR_BUFFER                     00000BC6-R  417     (6)      1096    (12)      1203    (13)      1310    (14)      1398    (15)
                                                              1455    (16)      1541    (17)      1627    (18)      1713    (19)
                                                              1803    (20)      1883    (21)      1955    (22)      2040    (23)
                                                              597     (7)       641     (8)       749     (9)       877     (10)
                                                              988     (11)
CODE_00                         =00000000    153     (2)
CODE_01                         =00000001    154     (2)
CODE_02                         =00000002    155     (2)
CODE_03                         =00000003    156     (2)
CODE_04                         =00000004    157     (2)    #-771     (9)     #-895     (10)
CODE_05                         =00000005    158     (2)    #-1963    (22)
CODE_06                         =00000006    159     (2)    #-646     (8)
CODE_07                         =00000007    160     (2)    #-1809    (20)
CODE_08                         =00000008    161     (2)    #-2046    (23)
CODE_09                         =00000009    162     (2)
CODE_0A                         =0000000A    163     (2)    #-1004    (11)    #-1112    (12)    #-1219    (13)    #-1326    (14)
CODE_0B                         =0000000B    164     (2)    #-1462    (16)    #-1548    (17)    #-1634    (18)    #-1720    (19)
CODE_0C                         =0000000C    165     (2)    #-1890    (21)
CPU$V_COMET                     =00000002    87      (2)
CPU$V_HS                        =00000000    87      (2)
CPU$V_STAR                      =00000001    87      (2)
DATA_003                         00000020-R  575     (7)      575     (7)
DATA_004                         00000024-R  1376    (15)     1376    (15)
DATA_1                           0000095D-R  339     (5)    #-1468    (16)    #-1554    (17)    #-1640    (18)    #-1726    (19)
                                                            #-1814    (20)    #-1895    (21)    #-1968    (22)    #-2051    (23)
                                                            #-651     (8)
DATA_2                           00000961-R  341     (5)    #-1010    (11)    #-1118    (12)    #-1225    (13)    #-1332    (14)
                                                            #-785     (9)
DATA_3                           00000965-R  343     (5)    #-900     (10)
DEFAULT                         =00000000    90      (2)
DS$ABORT                         00010020    85      (2)      1000    (11)      1026    (11)      1108    (12)      1134    (12)
                                                              1215    (13)      1241    (13)      1322    (14)      1348    (14)
                                                              1484    (16)      1570    (17)      1656    (18)      1746    (19)
                                                              1825    (20)      1910    (21)      1979    (22)      2062    (23)
                                                              663     (8)       665     (8)       756     (9)       764     (9)
                                                              780     (9)       808     (9)       810     (9)       814     (9)
                                                              887     (10)      923     (10)
DS$ASKADR                        00010090    85      (2)
DS$ASKDATA                       00010080    85      (2)
DS$ASKLGCL                       00010098    85      (2)      1391    (15)      590     (7)
DS$ASKSTR                        000100A0    85      (2)
DS$ASKVLD                        00010088    85      (2)
DS$ATTACH                        000101A8    85      (2)
DS$BGNSUB                        00010030    85      (2)      1095    (12)      1202    (13)      1309    (14)      1454    (16)
                                                              1540    (17)      1626    (18)      1712    (19)      1802    (20)
                                                              1882    (21)      1954    (22)      2036    (23)      640     (8)
                                                              748     (9)       876     (10)      987     (11)
DS$BRANCH                        000100A8    85      (2)
DS$BREAK                         00010058    85      (2)      1353    (14)      2067    (23)
DS$CANWAIT                       00010070    85      (2)
DS$CHANNEL                       00010180    85      (2)
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DS$CKLOOP                            00010040      85      (2)
DS$CLRVEC                            00010168      85      (2)      1027    (11)      1028    (11)      1135    (12)      1136    (12)
                                                                    1242    (13)      1243    (13)      1349    (14)      1350    (14)
                                                                    1352    (14)      1485    (16)      1571    (17)      1657    (18)
                                                                    1747    (19)      1826    (20)      1911    (21)      1980    (22)
                                                                    2063    (23)      2066    (23)      765     (9)       816     (9)
                                                                    888     (10)      925     (10)
DS$CNTRLC                            00010078      85      (2)
DS$CVTREG                            000100B0      85      (2)      382     (5)       386     (5)       391     (5)
DS$ENDPASS                           00010010      85      (2)
DS$ENDSUB                            00010038      85      (2)      1029    (11)      1137    (12)      1244    (13)      1351    (14)
                                                                    1486    (16)      1572    (17)      1658    (18)      1748    (19)
                                                                    1827    (20)      1912    (21)      1981    (22)      2064    (23)
                                                                    666     (8)       817     (9)       926     (10)
DS$ERRDEV                            000100C8      85      (2)
DS$ERRHARD                           000100D0      85      (2)      1024    (11)      1107    (12)      1132    (12)      1214    (13)
                                                                    1239    (13)      1321    (14)      1346    (14)      1482    (16)
                                                                    1568    (17)      1654    (18)      1744    (19)      1823    (20)
                                                                    1908    (21)      1977    (22)      2060    (23)      661     (8)
                                                                    763     (9)       807     (9)       886     (10)      921     (10)
                                                                    999     (11)
DS$ERRPREP                           00010108      85      (2)
DS$ERRSOFT                           000100D8      85      (2)
DS$ERRSYS                            000100C0      85      (2)      755     (9)       779     (9)       813     (9)
DS$ESCAPE                            00010050      85      (2)
DS$FREEDBGSYM                        000101B8      85      (2)
DS$GETBUF                            00010120      85      (2)
DS$GETMEM                            00010130      85      (2)
DS$GPHARD                            00010018      85      (2)
DS$HELP                              000101B0      85      (2)
DS$INITSCB                           00010170      85      (2)
DS$INLOOP                            00010048      85      (2)
DS$K_ERROR                          =00000002      83      (2)
DS$K_NORMAL                         =00000001      83      (2)
DS$K_SEVERE                         =00000004      83      (2)
DS$K_SUBSYS                         =00000066      83      (2)      83      (2)
DS$K_WARNING                        =00000000      83      (2)
DS$LOAD                              00010198      85      (2)
DS$LOADPCS                           000101C0      85      (2)
DS$MAPDBGBLOCK                       00010118      85      (2)
DS$MMOFF                             00010158      85      (2)      815     (9)       924     (10)
DS$MMON                              00010150      85      (2)      752     (9)       879     (10)
DS$MOVPHY                            00010148      85      (2)
DS$MOVVRT                            00010140      85      (2)
DS$PARSE                             000100B8      85      (2)
DS$PRINTB                            000100E0      85      (2)      352     (5)       353     (5)       355     (5)       357     (5)
                                                                    359     (5)       361     (5)       363     (5)       366     (5)
                                                                    371     (5)       375     (5)       383     (5)       387     (5)
                                                                    394     (5)       402     (5)       407     (5)
DS$PRINTF                            000100F0      85      (2)      1004    (11)      1005    (11)      1112    (12)      1113    (12)
                                                                    1219    (13)      1220    (13)      1326    (14)      1327    (14)
                                                                    1380    (15)      1386    (15)      1393    (15)      1462    (16)
                                                                    1463    (16)      1548    (17)      1549    (17)      1634    (18)
                                                                    1635    (18)      1720    (19)      1721    (19)      1809    (20)
                                                                    1810    (20)      1890    (21)      1891    (21)      1963    (22)
                                                                    1964    (22)      2046    (23)      2047    (23)      579     (7)
                                                                    585     (7)       592     (7)       646     (8)       647     (8)
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                                                             771     (9)      772     (9)      895     (10)     896     (10)
DS$PRINTS                      000100F8     85     (2)
DS$PRINTSIG                    00010100     85     (2)
DS$PRINTX                      000100E8     85     (2)       368     (5)      373     (5)      377     (5)      392     (5)
                                                             404     (5)
DS$PROBE                       000101A0     85     (2)
DS$RELBUF                      00010128     85     (2)
DS$RELMEM                      00010138     85     (2)
DS$SETIPL                      00010178     85     (2)
DS$SETMAP                      00010188     85     (2)
DS$SETPRIEXV                   00010110     85     (2)
DS$SETVEC                      00010160     85     (2)       1098    (12)     1099    (12)     1205    (13)     1206    (13)
                                                             1312    (14)     1313    (14)     1399    (15)     1457    (16)
                                                             1543    (17)     1629    (18)     1715    (19)     1805    (20)
                                                             1885    (21)     2042    (23)     598     (7)      757     (9)
                                                             766     (9)      880     (10)     890     (10)     990     (11)
                                                             991     (11)
DS$SHOCHAN                     00010190     85     (2)
DS$SUMMARY                     00010028     85     (2)
DS$WAITMS                      00010060     85     (2)
DS$WAITUS                      00010068     85     (2)
DS$_ARITH                     =006600D0     83     (2)
DS$_BADLINK                   =006600F0     83     (2)
DS$_BADTYPE                   =006600E8     83     (2)
DS$_CHME                      =006600A8     83     (2)
DS$_CHMK                      =006600E0     83     (2)
DS$_DEVNAME                   =00660108     83     (2)
DS$_ERROR                     =00660002     83     (2)
DS$_FHWE                      =00660068     83     (2)
DS$_FRAGBUF                   =00660080     83     (2)
DS$_ICBUSY                    =006600C8     83     (2)
DS$_ICERR                     =006600C0     83     (2)
DS$_IHWE                      =00660060     83     (2)
DS$_ILLCHAR                   =00660018     83     (2)
DS$_ILLPAGCNT                 =00660078     83     (2)
DS$_ILLUNIT                   =00660100     83     (2)
DS$_INSFMEM                   =00660050     83     (2)
DS$_IPL2HI                    =006600B8     83     (2)
DS$_IVADDR                    =00660040     83     (2)
DS$_IVVECT                    =00660038     83     (2)
DS$_KRNLSTK                   =00660090     83     (2)
DS$_LOGIC                     =00660070     83     (2)
DS$_MCHK                      =00660088     83     (2)
DS$_MMOFF                     =00660058     83     (2)
DS$_NEEDUNIT                  =006600F8     83     (2)
DS$_NOPCS                     =00660110     83     (2)
DS$_NORMAL                    =00660001     83     (2)
DS$_NOSUPPORT                 =006600B1     83     (2)
DS$_NOTDON                    =00660030     83     (2)
DS$_NOTIMP                    =006600B0     83     (2)       83      (2)
DS$_NULLSTR                   =00660010     83     (2)
DS$_OVERFLOW                  =00660008     83     (2)
DS$_POWER                     =00660098     83     (2)
DS$_PROGERR                   =00660020     83     (2)
DS$_SEVERE                    =00660004     83     (2)
DS$_TRANSL                    =006600A0     83     (2)
DS$_TRUNCATE                  =00660028     83     (2)
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                                                                        K  6
ZZ-ENKAX-1.3    Cross reference                                      3-AUG-1983          Fiche 2  Frame K6          Sequence 281
ENKAXD                          VAX-11/730 Specific CPU Cluster Exercise   3-AUG-1983 13:43:40  VAX-11 Macro V03-00          Page  73
Cross reference                                                            3-AUG-1983 09:57:17  WRKD$0:[PAN.ENKAX]ENKAXD.MAR;75  (23)

DS$_UNEXPINT                     =006600D8    83      (2)
DS$_VASFULL                      =00660048    83      (2)
DS$_WARNING                      =00660000    83      (2)         83      (2)
DSA$AL_APTMAIL                    0000FE00    87      (2)
DSA$AT_APTTXT                     0000FA00    87      (2)
DSA$GL_APTCOM                     0000FE04    87      (2)
DSA$GL_DEVLEN                     0000FE58    87      (2)
DSA$GL_ERRNO                      0000FE44    87      (2)
DSA$GL_EVENT                      0000FE48    87      (2)
DSA$GL_FLAGS                      0000FE00    87      (2)
DSA$GL_MSGTYP                     0000FE40    87      (2)
DSA$GL_PASSES                     0000FE08    87      (2)
DSA$GL_PASSNO                     0000FE54    87      (2)
DSA$GL_SECTNO                     0000FE10    87      (2)
DSA$GL_SID                        0000FE14    87      (2)
DSA$GL_SUBTNO                     0000FE4C    87      (2)
DSA$GL_TESTNO                     0000FE50    87      (2)
DSA$GL_UNITS                      0000FE0C    87      (2)
DSA$GQ_MSGPTR                     0000FE68    87      (2)
DSA$GT_DEVNAM                     0000FE5C    87      (2)
DSA$M_APT                        =80000000    87      (2)
DSA$M_BELL                       =00000008    87      (2)
DSA$M_BINARY                     =00000002    87      (2)
DSA$M_CRD_AUTOTEST               =00000800    87      (2)
DSA$M_CRD_MENUTEST               =00010000    87      (2)
DSA$M_CRD_TRACE                  =00020000    87      (2)
DSA$M_DEBUG                      =04000000    87      (2)
DSA$M_HALT                       =00000001    87      (2)
DSA$M_IE1                        =00000010    87      (2)
DSA$M_IE2                        =00000020    87      (2)
DSA$M_IE3                        =00000040    87      (2)
DSA$M_IES                        =00000080    87      (2)
DSA$M_LOAD_DEBUGGER              =40000000    87      (2)
DSA$M_LOOP                       =00000004    87      (2)
DSA$M_NORPT                      =08000000    87      (2)
DSA$M_OPER                       =00001000    87      (2)
DSA$M_PASSO                      =20000000    87      (2)
DSA$M_PROMPT                     =00002000    87      (2)
DSA$M_QA                         =00008000    87      (2)
DSA$M_QUICK                      =00000100    87      (2)
DSA$M_SEARCH                     =00004000    87      (2)
DSA$M_TRACE                      =00000400    87      (2)
DSA$M_USER                       =10000000    87      (2)
DSA$M_VERIFY                     =00000200    87      (2)
DSA$V_APT                        =0000001F    87      (2)
DSA$V_BELL                       =00000003    87      (2)
DSA$V_BINARY                     =00000001    87      (2)
DSA$V_CRD_AUTOTEST               =0000000B    87      (2)
DSA$V_CRD_MENUTEST               =00000010    87      (2)
DSA$V_CRD_TRACE                  =00000011    87      (2)
DSA$V_DEBUG                      =0000001A    87      (2)
DSA$V_HALT                       =00000000    87      (2)
DSA$V_IE1                        =00000004    87      (2)
DSA$V_IE2                        =00000005    87      (2)
DSA$V_IE3                        =00000006    87      (2)
DSA$V_IES                        =00000007    87      (2)
DSA$V_LOAD_DEBUGGER              =0000001E    87      (2)
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DSA$V_LOOP                    =00000002    87     (2)
DSA$V_NORPT                   =0000001B    87     (2)
DSA$V_OPER                    =0000000C    87     (2)
DSA$V_PASSO                   =0000001D    87     (2)
DSA$V_PROMPT                  =0000000D    87     (2)
DSA$V_QA                      =0000000F    87     (2)
DSA$V_QUICK                   =00000008    87     (2)
DSA$V_SEARCH                  =0000000E    87     (2)
DSA$V_TRACE                   =0000000A    87     (2)
DSA$V_USER                    =0000001C    87     (2)
DSA$V_VERIFY                  =00000009    87     (2)
ENV$M_DOMAIN                  =00000002    67     (2)
ENV$M_LEVEL                   =00000001    67     (2)
ENV$M_SUPER                   =000003FC    67     (2)
ENV$S_DOMAIN                  =00000001    67     (2)
ENV$S_LEVEL                   =00000001    67     (2)
ENV$S_SUPER                   =00000008    67     (2)
ENV$V_DOMAIN                  =00000001    67     (2)     67     (2)
ENV$V_LEVEL                   =00000000    67     (2)     67     (2)
ENV$V_SUPER                   =00000002    67     (2)
ENV$_CPU                      =00000000    67     (2)     67     (2)
ENV$_FUNCTIONAL               =00000000    67     (2)     67     (2)
ENV$_REPAIR                   =00000001    67     (2)     67     (2)
ENV$_SUPER                    =00000001    67     (2)
ENV$_SYSTEM                   =00000001    67     (2)     67     (2)
ERR$_MSGADR                   =0000000C    84     (2)
ERR$_NARGS                    =0000000A    84     (2)
ERR$_NUM                      =00000004    84     (2)
ERR$_P1                       =00000014    84     (2)     353    (5)
ERR$_P2                       =00000018    84     (2)
ERR$_P3                       =0000001C    84     (2)
ERR$_P4                       =00000020    84     (2)
ERR$_P5                       =00000024    84     (2)
ERR$_P6                       =00000028    84     (2)
ERR$_POINTER                  =00000010    84     (2)
ERR$_UNIT                     =00000008    84     (2)
ERROR_CHECK                    00000C85-R  505    (6)     1022   (11)     1130   (12)    1237   (13)     1344   (14)
                                                          1480   (16)     1566   (17)    1652   (18)     1742   (19)
                                                          1821   (20)     1906   (21)    1975   (22)     2058   (23)
                                                          659     (8)     805     (9)     919    (10)
ERR_MESSAGE                    00000969-R  348    (5)     1024   (11)     1132   (12)    1239   (13)     1346   (14)
                                                          1482   (16)     1568   (17)    1654   (18)     1744   (19)
                                                          1823   (20)     1908   (21)    1977   (22)     2060   (23)
                                                          661     (8)     807     (9)     921    (10)
GPR_TABLE                      00000000-XR                395     (5)     428     (6)     509     (6)
HALT                          =00000004    90     (2)     1376   (15)     575     (7)
IPR                           =00000006    90     (2)
JUMP                           00000040-R  170    (2)   #-1001   (11)   #-1002   (11)  #-1109   (12)   #-1110   (12)
                                                        #-1216   (13)   #-1217   (13)  #-1323   (14)   #-1324   (14)
                                                        #-1459   (16)   #-1460   (16)  #-1545   (17)   #-1546   (17)
                                                        #-1631   (18)   #-1632   (18)  #-1717   (19)   #-1718   (19)
                                                        #-1806   (20)   #-1807   (20)  #-1887   (21)   #-1888   (21)
                                                        #-1960   (22)   #-1961   (22)  #-2043   (23)   #-2044   (23)
                                                        #-643     (8)   #-644     (8)  #-767     (9)   #-768     (9)
                                                        #-891    (10)   #-892    (10)
KA_PTABLE                      00000000-XR              #-1378   (15)   #-577     (7)
KA_UNIT_NO                     00000000-XR              #-1024   (11)   #-1107   (12)  #-1132   (12)   #-1214   (13)
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                                                          #-1239   (13)    #-1321   (14)    #-1346   (14)    #-1482   (16)
                                                          #-1568   (17)    #-1654   (18)    #-1744   (19)    #-1823   (20)
                                                          #-1908   (21)    #-1977   (22)    #-2060   (23)    #-661    (8)
                                                          #-763    (9)     #-779    (9)     #-807    (9)     #-813    (9)
                                                          #-886    (10)    #-921    (10)    #-999    (11)
LDPCTX                          =0000000B    90    (2)
LOAD_GPR                        00000BDE-R   427   (6)      1011   (11)      1119   (12)      1226   (13)      1333   (14)
                                                            1469   (16)      1555   (17)      1641   (18)      1727   (19)
                                                            1815   (20)      1896   (21)      1969   (22)      2052   (23)
                                                            652    (8)       787    (9)       901    (10)
L_ACT_ISP                       00000000-XR               #-371    (5)     #-373    (5)     #-457    (6)     #-523    (6)
L_ACT_KSP                       00000000-XR               #-366    (5)     #-368    (5)     #-456    (6)     #-519    (6)
L_ACT_PSL                       00000000-XR                 1016   (11)    #-1105   (12)      1106   (12)      1124   (12)
                                                          #-1212   (13)      1213   (13)      1231   (13)    #-1319   (14)
                                                            1320   (14)      1338   (14)      1474   (16)      1560   (17)
                                                            1646   (18)      1736   (19)    #-386    (5)     #-387    (5)
                                                          #-458    (6)       517    (6)     #-526    (6)       531    (6)
                                                            536    (6)     #-761    (9)       762    (9)       799    (9)
                                                          #-884    (10)      885    (10)      912    (10)    #-997    (11)
                                                            998    (11)
L_ACT_SP                        00000000-XR               #-375    (5)     #-377    (5)     #-455    (6)     #-514    (6)
L_ADDRESS                       0000001C-R   103   (2)    #-773    (9)     #-774    (9)     #-775    (9)     #-776    (9)
                                                          #-782    (9)     #-789    (9)
L_COUNT                         00000018-R   102   (2)    #-419    (6)     #-421    (6)
L_CUR_ISP                       00000020-R   104   (2)    #-1006   (11)    #-1017   (11)    #-1021   (11)    #-1114   (12)
                                                          #-1125   (12)    #-1129   (12)    #-1221   (13)    #-1232   (13)
                                                          #-1236   (13)    #-1328   (14)    #-1339   (14)    #-1343   (14)
                                                          #-1464   (16)    #-1475   (16)    #-1479   (16)    #-1550   (17)
                                                          #-1561   (17)    #-1565   (17)    #-1636   (18)    #-1647   (18)
                                                          #-1651   (18)    #-1722   (19)    #-1737   (19)    #-1741   (19)
                                                          #-770    (9)     #-800    (9)     #-804    (9)     #-894    (10)
                                                          #-913    (10)    #-917    (10)
L_CUR_SCBB                      00000038-R   110   (2)    #-1886   (21)    #-1905   (21)
L_EXP_AP                        00000000-XR               #-435    (6)
L_EXP_FP                        00000000-XR               #-436    (6)
L_EXP_ISP                       00000000-XR               #-1009   (11)    #-1117   (12)    #-1224   (13)    #-1331   (14)
                                                          #-1467   (16)    #-1553   (17)    #-1639   (18)    #-1725   (19)
                                                          #-1813   (20)    #-1894   (21)    #-1967   (22)    #-2050   (23)
                                                          #-371    (5)     #-523    (6)     #-650    (8)     #-784    (9)
                                                          #-899    (10)
L_EXP_KSP                       00000000-XR               #-1008   (11)    #-1116   (12)    #-1223   (13)    #-1330   (14)
                                                          #-1466   (16)    #-1552   (17)    #-1638   (18)    #-1724   (19)
                                                          #-1812   (20)    #-1893   (21)    #-1966   (22)    #-2049   (23)
                                                          #-366    (5)     #-519    (6)     #-649    (8)     #-783    (9)
                                                          #-898    (10)
L_EXP_MOD                       00000024-R   105   (2)    #-529    (6)     #-531    (6)
L_EXP_PSL                       00000000-XR               #-1010   (11)    #-1118   (12)    #-1225   (13)    #-1332   (14)
                                                          #-1468   (16)    #-1554   (17)    #-1640   (18)    #-1726   (19)
                                                          #-1814   (20)    #-1895   (21)    #-1968   (22)    #-2051   (23)
                                                          #-382    (5)     #-383    (5)     #-391    (5)     #-392    (5)
                                                          #-526    (6)       529    (6)       534    (6)     #-651    (8)
                                                          #-785    (9)     #-900    (10)
L_EXP_SP                        00000000-XR               #-1007   (11)    #-1115   (12)    #-1222   (13)    #-1329   (14)
                                                          #-1465   (16)    #-1551   (17)    #-1637   (18)    #-1723   (19)
                                                          #-1811   (20)    #-1892   (21)    #-1965   (22)    #-2048   (23)
                                                          #-375    (5)     #-514    (6)     #-648    (8)     #-782    (9)
                                                          #-897    (10)
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                                                                        N  6
ZZ-ENKAX-1.3     Cross reference                                    3-AUG-1983              Fiche 2  Frame N6            Sequence 284
ENKAXD                              VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:43:40  VAX-11 Macro V03-00              Page  76
Cross reference                                                            3-AUG-1983 09:57:17  WRKD$0:[PAN.ENKAXJENKAXD.MAR;75  (23)

L_EXP_STACK                        00000028-R    106    (2)     #-534    (6)      #-536    (6)
L_FLAGS                            0000003C-R    112    (2)     #-1012   (11)     #-1014   (11)        1023   (11)        1025   (11)
                                                                #-1097   (12)     #-1120   (12)     #-1122   (12)        1131   (12)
                                                                   1133  (12)     #-1204   (13)     #-1227   (13)     #-1229   (13)
                                                                   1238  (13)        1240  (13)     #-1311   (14)     #-1334   (14)
                                                                #-1336   (14)        1345  (14)        1347  (14)     #-1456   (16)
                                                                #-1470   (16)     #-1472   (16)        1481  (16)        1483  (16)
                                                                #-1542   (17)     #-1556   (17)     #-1558   (17)        1567  (17)
                                                                   1569  (17)     #-1628   (18)     #-1642   (18)     #-1644   (18)
                                                                   1653  (18)        1655  (18)     #-170    (2)      #-1714   (19)
                                                                #-1731   (19)     #-1733   (19)        1743  (19)        1745  (19)
                                                                #-1804   (20)     #-1816   (20)     #-1818   (20)        1822  (20)
                                                                   1824  (20)     #-1884   (21)     #-1898   (21)     #-1901   (21)
                                                                   1907  (21)        1909  (21)     #-1956   (22)     #-1970   (22)
                                                                #-1972   (22)        1976  (22)        1978  (22)     #-2041   (23)
                                                                #-2053   (23)     #-2055   (23)        2059  (23)        2061  (23)
                                                                   354   (5)         356   (5)         358   (5)         360   (5)
                                                                   362   (5)         364   (5)         365   (5)         369   (5)
                                                                   370   (5)         374   (5)         378   (5)         393   (5)
                                                                   406   (5)      #-467    (6)      #-477    (6)      #-486    (6)
                                                                #-495    (6)      #-512    (6)      #-516    (6)      #-518    (6)
                                                                #-521    (6)         522   (6)      #-525    (6)      #-538    (6)
                                                                #-539    (6)         540   (6)      #-541    (6)         542   (6)
                                                                #-543    (6)         544   (6)      #-545    (6)         546   (6)
                                                                #-547    (6)         548   (6)      #-549    (6)         550   (6)
                                                                #-551    (6)      #-642    (8)      #-653    (8)      #-656    (8)
                                                                   660   (8)         664   (8)      #-750    (9)      #-788    (9)
                                                                #-795    (9)         806   (9)         809   (9)      #-878    (10)
                                                                #-903    (10)     #-908    (10)        920   (10)        922   (10)
                                                                #-989    (11)
L_ISP                              00000000-XR                  #-1007   (11)     #-1115   (12)     #-1222   (13)     #-1329   (14)
                                                                #-1397   (15)     #-1464   (16)     #-1467   (16)     #-1550   (17)
                                                                #-1553   (17)     #-1636   (18)     #-1639   (18)     #-1722   (19)
                                                                #-1725   (19)     #-1813   (20)     #-1894   (21)     #-1967   (22)
                                                                #-2050   (23)     #-596    (7)      #-650    (8)
L_KA_FLAGS                         00000000-XR                     2038  (23)
L_KSP                              00000000-XR                  #-1008   (11)     #-1116   (12)     #-1223   (13)     #-1330   (14)
                                                                #-1396   (15)     #-1465   (16)     #-1466   (16)     #-1551   (17)
                                                                #-1552   (17)     #-1637   (18)     #-1638   (18)     #-1723   (19)
                                                                #-1724   (19)     #-1811   (20)     #-1812   (20)     #-1820   (20)
                                                                #-1893   (21)     #-1904   (21)     #-1965   (22)     #-1966   (22)
                                                                #-1974   (22)     #-2048   (23)     #-2049   (23)     #-2057   (23)
                                                                #-595    (7)      #-648    (8)      #-658    (8)      #-783    (9)
                                                                #-898    (10)
L_NXM_ADR                         =00500200      149    (2)     #-1897   (21)     #-1959   (22)     #-1963   (22)     #-1971   (22)
L_OLDPROT                          0000002C-R    107    (2)        777   (9)         811   (9)
L_PAGEOEND                         00000014-R    100    (2)
L_PAGEND                           0000000C-R    98     (2)     #-775    (9)
L_PAGESTRT                         00000008-R    97     (2)     #-774    (9)         777   (9)         811   (9)
L_PAGEZERO                         00000010-R    99     (2)     #-751    (9)         753   (9)
L_TEMP                             00000034-R    109    (2)     #-1728   (19)     #-1729   (19)     #-1730   (19)     #-1735   (19)
                                                                #-476    (6)
MANUAL                            =00000001      90     (2)        1376  (15)        575   (7)
MCHK                              =00000005      90     (2)
MEM                               =00000009      90     (2)
MM_MSG                             00000920-R    331    (4)
MODELIST                           00000000-XR                     382   (5)         386   (5)         391   (5)
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MSG_003                         00000002-R   556     (7)      575    (7)
MSG_004                         00000002-R   1357    (15)    1376    (15)
M_BAD_MODE                     =00000040     127     (2)
M_BAD_STK                      =00000080     129     (2)
M_CHMX_ERR                     =00000008     121     (2)    #-477    (6)
M_DONE                         =00000002     117     (2)    #-170    (2)
M_ERROR_FLAG                   =00001000     139     (2)    #-512    (6)    #-516    (6)    #-521    (6)    #-525    (6)
                                                            #-539    (6)    #-541    (6)    #-543    (6)    #-545    (6)
                                                            #-547    (6)    #-549    (6)    #-551    (6)
M_EXECUTE_ERR                  =00000004     119     (2)    #-1014   (11)   #-1122   (12)   #-1229   (13)   #-1336   (14)
                                                            #-1472   (16)   #-1558   (17)   #-1644   (18)   #-1733   (19)
                                                            #-1818   (20)   #-1901   (21)   #-1972   (22)   #-2055   (23)
                                                            #-656    (8)    #-795    (9)    #-908    (10)
M_FATAL_ERR                    =00000100     131     (2)    #-538    (6)
M_GPR_ERR                      =00000400     135     (2)    #-512    (6)
M_ISP_ERR                      =00004000     143     (2)    #-525    (6)
M_ISTK                         =00010000     147     (2)    #-518    (6)
M_KSP_ERR                      =00002000     141     (2)    #-521    (6)
M_PSL_ERR                      =00000200     133     (2)    #-539    (6)
M_READY                        =00000001     115     (2)    #-1012   (11)   #-1120   (12)   #-1227   (13)   #-1334   (14)
                                                            #-1470   (16)   #-1556   (17)   #-1642   (18)   #-1731   (19)
                                                            #-1816   (20)   #-1898   (21)   #-1970   (22)   #-2053   (23)
                                                            #-653    (8)    #-788    (9)    #-903    (10)
M_SP_ERR                       =00008000     145     (2)    #-516    (6)
M_TIMER                        =00000020     125     (2)    #-467    (6)
M_XFC                          =00000800     137     (2)    #-495    (6)
M_XFC_ERR                      =00000010     123     (2)    #-486    (6)
PAR$M_ATDEF                    =00000010     88      (2)
PAR$M_ATHI                     =00000008     88      (2)
PAR$M_ATLO                     =00000004     88      (2)
PAR$M_NODEF                    =00000002     88      (2)
PAR$V_ATDEF                    =00000004     88      (2)
PAR$V_ATHI                     =00000003     88      (2)
PAR$V_ATLO                     =00000002     88      (2)
PAR$V_NODEF                    =00000001     88      (2)
PAR$_BIN                       =00000002     88      (2)
PAR$_DEC                       =0000000A     88      (2)
PAR$_HEX                       =00000010     88      (2)
PAR$_NO                        =00000000     88      (2)    #-1391   (15)   #-590    (7)
PAR$_OCT                       =00000008     88      (2)
PAR$_YES                       =00000001     88      (2)
POWER                          =00000003     90      (2)
PR$_ISP                         00000000-XR                 #-1021   (11)   #-1129   (12)   #-1236   (13)   #-1343   (14)
                                                            #-1397   (15)   #-1479   (16)   #-1565   (17)   #-1651   (18)
                                                            #-1741   (19)   #-457    (6)    #-596    (7)    #-804    (9)
                                                            #-917    (10)
PR$_KSP                         00000000-XR                 #-456    (6)
PR$_SCBB                        00000000-XR                 #-1728   (19)   #-1886   (21)   #-1897   (21)   #-1905   (21)
                                                            #-1957   (22)
PRT$C_KR                        00000000-XR                 #-777    (9)
PRT$C_KW                        00000000-XR                 #-753    (9)    #-811    (9)
PSL$C_EXEC                     =00000001     86      (2)
PSL$C_KERNEL                   =00000000     86      (2)
PSL$C_SUPER                    =00000002     86      (2)
PSL$C_USER                     =00000003     86      (2)
PSL$K_EXEC                     =00000001     86      (2)
PSL$K_KERNEL                   =00000000     86      (2)
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PSL$K_SUPER                     =00000002    86      (2)
PSL$K_USER                      =00000003    86      (2)
PSL$M_C                         =00000001    86      (2)
PSL$M_CBIT                      =00000001    86      (2)
PSL$M_CM                        =80000000    86      (2)        86     (2)
PSL$M_CURMOD                    =03000000    86      (2)
PSL$M_DV                        =00000080    86      (2)
PSL$M_FPD                       =08000000    86      (2)        86     (2)
PSL$M_FU                        =00000040    86      (2)
PSL$M_IPL                       =001F0000    86      (2)
PSL$M_IS                        =04000000    86      (2)
PSL$M_IV                        =00000020    86      (2)
PSL$M_N                         =00000008    86      (2)
PSL$M_NBIT                      =00000008    86      (2)
PSL$M_PRVMOD                    =00C00000    86      (2)
PSL$M_SAFBITS                   =000037FF    86      (2)
PSL$M_TBIT                      =00000010    86      (2)
PSL$M_TP                        =40000000    86      (2)        86     (2)
PSL$M_V                         =00000002    86      (2)
PSL$M_VBIT                      =00000002    86      (2)
PSL$M_Z                         =00000004    86      (2)
PSL$M_ZBIT                      =00000004    86      (2)
PSL$S_CURMOD                    =00000002    86      (2)     #-528     (6)     #-530     (6)
PSL$S_IPL                       =00000005    86      (2)
PSL$S_PRVMOD                    =00000002    86      (2)
PSL$V_C                         =00000000    86      (2)
PSL$V_CBIT                      =00000000    86      (2)
PSL$V_CM                        =0000001F    86      (2)
PSL$V_CURMOD                    =00000018    86      (2)     #-528     (6)     #-530     (6)
PSL$V_DV                        =00000007    86      (2)
PSL$V_FPD                       =0000001B    86      (2)
PSL$V_FU                        =00000006    86      (2)
PSL$V_IPL                       =00000010    86      (2)
PSL$V_IS                        =0000001A    86      (2)     #-1016    (11)    #-1106    (12)    #-1124    (12)    #-1213    (13)
                                                             #-1231    (13)    #-1320    (14)    #-1338    (14)    #-1474    (16)
                                                             #-1560    (17)    #-1646    (18)    #-1736    (19)    #-517     (6)
                                                             #-533     (6)     #-535     (6)     #-762     (9)     #-799     (9)
                                                             #-885     (10)    #-912     (10)    #-998     (11)
PSL$V_IV                        =00000005    86      (2)
PSL$V_N                         =00000003    86      (2)
PSL$V_NBIT                      =00000003    86      (2)
PSL$V_PRVMOD                    =00000016    86      (2)
PSL$V_TBIT                      =00000004    86      (2)
PSL$V_TP                        =0000001E    86      (2)
PSL$V_V                         =00000001    86      (2)
PSL$V_VBIT                      =00000001    86      (2)
PSL$V_Z                         =00000002    86      (2)
PSL$V_ZBIT                      =00000002    86      (2)
READ_GPR                         00000C06-R  444     (6)        171    (2)
REG_TABLE                        00000000-XR                    399    (5)
RENTRY1                          00000143-R  657     (8)        645    (8)
RENTRY10                         000008A8-R  1211    (13)       1205   (13)
RENTRY11                         0000095D-R  1230    (13)       1218   (13)
RENTRY12                         00000A1C-R  1318    (14)       1312   (14)
RENTRY13                         00000AD1-R  1337    (14)       1325   (14)
RENTRY15                         0000016D-R  1473    (16)       1461   (16)
RENTRY16                         0000029F-R  1559    (17)       1547   (17)
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ENK
1.2
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RENTRY17                         000003D1-R   1645    (18)      1633    (18)
RENTRY18                         00000520-R   1734    (19)      1719    (19)
RENTRY19                         00000649-R   1819    (20)      1808    (20)
RENTRY2                          00000208-R   760     (9)       757     (9)
RENTRY20                         0000075D-R   1903    (21)      1889    (21)
RENTRY21                         0000086F-R   1973    (22)      1962    (22)
RENTRY22                         0000097B-R   2056    (23)      2045    (23)
RENTRY3                          00000343-R   797     (9)       769     (9)
RENTRY4                          00000434-R   883     (10)      880     (10)
RENTRY5                          00000508-R   910     (10)      893     (10)
RENTRY6                          000005C0-R   996     (11)      990     (11)
RENTRY7                          00000675-R   1015    (11)      1003    (11)
RENTRY8                          00000734-R   1104    (12)      1098    (12)
RENTRY9                          000007E9-R   1123    (12)      1111    (12)
RENTRY_POINT                     00000004-R   96      (2)     #-1003    (11)     #-1111    (12)     #-1218    (13)     #-1325    (14)
                                                              #-1461    (16)     #-1547    (17)     #-1633    (18)     #-1719    (19)
                                                              #-1808    (20)     #-1889    (21)     #-1962    (22)     #-2045    (23)
                                                                459     (6)      #-645     (8)      #-769     (9)      #-893     (10)
RESTART                         =00000100      169     (2)     #-1001    (11)     #-1002    (11)     #-1109    (12)     #-1110    (12)
                                                              #-1216    (13)     #-1217    (13)     #-1323    (14)     #-1324    (14)
                                                              #-1459    (16)     #-1460    (16)     #-1545    (17)     #-1546    (17)
                                                              #-1631    (18)     #-1632    (18)     #-1717    (19)     #-1718    (19)
                                                              #-1806    (20)     #-1807    (20)     #-1887    (21)     #-1888    (21)
                                                              #-1960    (22)     #-1961    (22)     #-2043    (23)     #-2044    (23)
                                                              #-643     (8)      #-644     (8)      #-767     (9)      #-768     (9)
                                                              #-891     (10)     #-892     (10)
SCB$L_ACCESS                     00000020     82      (2)
SCB$L_ARITH                      00000034     82      (2)
SCB$L_BREAK                      0000002C     82      (2)
SCB$L_CHME                       00000044     82      (2)     #-1206    (13)     #-1243    (13)     #-1629    (18)     #-1657    (18)
SCB$L_CHMK                       00000040     82      (2)     #-1313    (14)     #-1350    (14)     #-1715    (19)     #-1729    (19)
                                                              #-1747    (19)
SCB$L_CHMS                       00000048     82      (2)     #-1099    (12)     #-1136    (12)     #-1543    (17)     #-1571    (17)
SCB$L_CHMU                       0000004C     82      (2)     #-1028    (11)     #-1457    (16)     #-1485    (16)     #-991     (11)
SCB$L_COMPAT                     00000030     82      (2)
SCB$L_KNLSTK                     00000008     82      (2)
SCB$L_MACHCHK                    00000004     82      (2)     #-1958    (22)     #-1980    (22)
SCB$L_OPCCUS                     00000014     82      (2)     #-1027    (11)     #-1098    (12)     #-1135    (12)     #-1205    (13)
                                                              #-1242    (13)     #-1312    (14)     #-1349    (14)     #-1805    (20)
                                                              #-1826    (20)     #-1885    (21)     #-1911    (21)     #-2042    (23)
                                                              #-2063    (23)     #-757     (9)      #-765     (9)      #-766     (9)
                                                              #-816     (9)      #-880     (10)     #-888     (10)     #-890     (10)
                                                              #-925     (10)     #-990     (11)
SCB$L_OPCDEC                     00000010     82      (2)
SCB$L_POWER                      0000000C     82      (2)
SCB$L_RADRMOD                    0000001C     82      (2)
SCB$L_ROPRAND                    00000018     82      (2)
SCB$L_RXDB                       000000F8     82      (2)
SCB$L_SFTLVL1                    00000084     82      (2)
SCB$L_SFTLVL10                   000000A8     82      (2)
SCB$L_SFTLVL11                   000000AC     82      (2)
SCB$L_SFTLVL12                   000000B0     82      (2)
SCB$L_SFTLVL13                   000000B4     82      (2)
SCB$L_SFTLVL14                   000000B8     82      (2)
SCB$L_SFTLVL15                   000000BC     82      (2)
SCB$L_SFTLVL2                    00000088     82      (2)
SCB$L_SFTLVL3                    0000008C     82      (2)
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SCB$L_SFTLVL4                   00000090     82     (2)
SCB$L_SFTLVL5                   00000094     82     (2)
SCB$L_SFTLVL6                   00000098     82     (2)
SCB$L_SFTLVL7                   0000009C     82     (2)
SCB$L_SFTLVL8                   000000A0     82     (2)
SCB$L_SFTLVL9                   000000A4     82     (2)
SCB$L_TBIT                      00000028     82     (2)
SCB$L_TIMER                     000000C0     82     (2)     #-1352    (14)    #-1399    (15)    #-2066    (23)    #-598     (7)
SCB$L_TRANSL                    00000024     82     (2)
SCB$L_TXDB                      000000FC     82     (2)
SCB$L_ZERO                      00000000     82     (2)
SEP_FUNCTIONAL                 =00000002     67     (2)
SEP_REPAIR                     =00000003     67     (2)
SIZ...                         =00000001     88     (2)       67      (2)       86      (2)       87      (2)       88      (2)
SYS$ALLOC                       00010238     85     (2)
SYS$ASCTIM                      00010248     85     (2)
SYS$ASSIGN                      00010250     85     (2)
SYS$BINTIM                      00010258     85     (2)
SYS$CANCEL                      00010260     85     (2)
SYS$CANTIM                      00010268     85     (2)
SYS$CLOSE                       000105B8     85     (2)
SYS$CLREF                       00010298     85     (2)
SYS$CONNECT                     000105C0     85     (2)
SYS$DALLOC                      000102D8     85     (2)
SYS$DASSGN                      000102E0     85     (2)
SYS$DISCONNECT                  000105D0     85     (2)
SYS$FAO                         00010350     85     (2)
SYS$FAOL                        00010358     85     (2)
SYS$GET                         00010580     85     (2)
SYS$GETCHN                      000104C8     85     (2)
SYS$GETTIM                      00010378     85     (2)
SYS$LKWSET                      000103A0     85     (2)
SYS$NUMTIM                      000103B8     85     (2)
SYS$OPEN                        00010608     85     (2)
SYS$QIO                         000103C8     85     (2)
SYS$QIOW                        00010200     85     (2)
SYS$READ                        00010590     85     (2)
SYS$READEF                      000103D0     85     (2)
SYS$SETAST                      000103F8     85     (2)
SYS$SETEF                       00010400     85     (2)
SYS$SETIMR                      00010420     85     (2)
SYS$SETPRI                      00010428     85     (2)
SYS$SETPRT                      00010430     85     (2)      753      (9)      777      (9)      811      (9)
SYS$SETRWM                      00010438     85     (2)
SYS$SETSWM                      00010448     85     (2)
SYS$ULKPAG                      00010460     85     (2)
SYS$ULWSET                      00010468     85     (2)
SYS$UNWIND                      00010470     85     (2)
SYS$WAITFR                      00010478     85     (2)
SYS$WFLAND                      00010488     85     (2)
SYS$WFLOR                       00010490     85     (2)
T3_S1                           000000AD-R   640    (8)
T3_S1_X                         0000018E-R   666    (8)
T3_S2                           00000199-R   748    (9)
T3_S2_X                         000003F6-R   817    (9)
T3_S3                           00000401-R   876    (10)
T3_S3_X                         00000576-R   926    (10)
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T3_S4                           00000581-R   987    (11)
T3_S4_X                         000006E9-R   1029   (11)
T3_S5                           000006F4-R   1095   (12)
T3_S5_X                         0000085D-R   1137   (12)
T3_S6                           00000868-R   1202   (13)
T3_S6_X                         000009D1-R   1244   (13)
T3_S7                           000009DC-R   1309   (14)
T3_S7_X                         00000B45-R   1351   (14)
T4_S1                           000000B1-R   1454   (16)
T4_S1_X                         000001D8-R   1486   (16)
T4_S2                           000001E3-R   1540   (17)
T4_S2_X                         0000030A-R   1572   (17)
T4_S3                           00000315-R   1626   (18)
T4_S3_X                         0000043C-R   1658   (18)
T4_S4                           00000447-R   1712   (19)
T4_S4_X                         00000592-R   1748   (19)
T4_S5                           0000059D-R   1802   (20)
T4_S5_X                         00000693-R   1827   (20)
T4_S6                           0000069E-R   1882   (21)
T4_S6_X                         000007B2-R   1912   (21)
T4_S7                           000007BD-R   1954   (22)
T4_S7_X                         000008B9-R   1981   (22)
T4_S8                           000008C4-R   2036   (23)
T4_S8_X                         000009C5-R   2064   (23)
TEST_003                        00000024-R   575    (7)       575    (7)
TEST_003_X                      00000B60-R   1353   (14)    #-580    (7)      #-593    (7)
TEST_004                        00000028-R   1376   (15)      1376   (15)
TEST_004_X                      000009E0-R   2067   (23)    #-1381   (15)     #-1394   (15)     #-2039   (23)
TIMER_SERVICE                   00000C54-R   466    (6)       1399   (15)      598     (7)
TU58                           =00000002     90     (2)
T_ACT_PSL                       00000888-R   316    (4)       387    (5)
T_BAD_DATA                      00000775-R   295    (4)
T_CHMESCB_ERR                   0000045F-R   244    (4)     #-1654   (18)
T_CHME_ERR                      000002DD-R   222    (4)     #-1239   (13)
T_CHMKSCB_ERR                   00000496-R   247    (4)     #-1744   (19)
T_CHMK_ERR                      00000305-R   225    (4)     #-1346   (14)
T_CHMSSCB_ERR                   00000428-R   241    (4)     #-1568   (17)
T_CHMS_ERR                      000002B5-R   219    (4)     #-1132   (12)
T_CHMUSCB_ERR                   000003F1-R   238    (4)     #-1482   (16)
T_CHMU_ERR                      0000028D-R   216    (4)     #-1024   (11)
T_CHMX_ERR                      000005FC-R   268    (4)       361    (5)
T_CONTINUE                      000000C3-R   187    (3)       1005   (11)      1113    (12)      1220    (13)      1327    (14)
                                                              1463   (16)      1549    (17)      1635    (18)      1721    (19)
                                                              1810   (20)      1891    (21)      1964    (22)      2047    (23)
                                                              647    (8)       772     (9)       896     (10)
T_DBL_MCHK_ERR                  000004CD-R   250    (4)     #-1977   (22)
T_EXECUTE                       000005A2-R   262    (4)       359    (5)
T_EXITING                       00000114-R   191    (3)       1393   (15)      592     (7)
T_EXP_PSL                       00000863-R   313    (4)       383    (5)
T_GOOD_DATA                     0000079C-R   298    (4)
T_GPR                           000008CA-R   322    (4)       394    (5)
T_GPR_ERR                       0000074C-R   292    (4)
T_HALT_ERR                      000001F1-R   207    (4)     #-661    (8)
T_HALT_MESS                     000001C1-R   204    (4)       352    (5)
T_INSTRUCTIONS                  00000085-R   182    (3)       1004   (11)      1112    (12)      1219    (13)      1326    (14)
                                                              1462   (16)      1548    (17)      1634    (18)      1720    (19)
                                                              1809   (20)      1890    (21)      1963    (22)      2046    (23)
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                                                         646      (8)      771      (9)      895      (10)
T_INVLDIS_ERR                     00000215-R   210    (4)    #-807     (9)
T_ISP_ERR1                        000006B6-R   280    (4)      371     (5)
T_ISP_ERR2                        000006E4-R   283    (4)      373     (5)
T_KSP_ERR1                        0000065A-R   274    (4)      366     (5)
T_KSP_ERR2                        00000688-R   277    (4)      368     (5)
T_NOT_DONE                        00000574-R   259    (4)      357     (5)
T_NOT_ON_IS                       0000083C-R   310    (4)      1107    (12)     1214     (13)     1321     (14)     763      (9)
                                                               886     (10)     999      (11)
T_NOT_ON_KS                       00000818-R   307    (4)
T_NOT_READY                       00000542-R   256    (4)      355     (5)
T_NOXOR                           0000090C-R   328    (4)      404     (5)
T_NO_KA730                        0000004D-R   179    (3)      1380    (15)     579      (7)
T_NXMIS_ERR                       00000250-R   213    (4)    #-921     (10)
T_NXM_WCS_ERR                     0000050B-R   253    (4)    #-2060    (23)
T_PAGEOPROT                       000007B7-R   301    (4)      755     (9)
T_PAGEPROT                        000007E5-R   304    (4)      779     (9)      813      (9)
T_PSL                             000008AD-R   319    (4)      392     (5)
T_REST_OFF                        00000191-R   198    (3)      1391    (15)     590      (7)
T_SCBBNXM_ERR                     00000363-R   231    (4)    #-1908    (21)
T_SCB_ERR                         0000032D-R   228    (4)    #-1823    (20)
T_SP_ERR1                         00000712-R   286    (4)      375     (5)
T_SP_ERR2                         00000740-R   289    (4)      377     (5)
T_TIMER                           00000632-R   271    (4)      407     (5)
T_WARNING                         00000129-R   194    (3)      1386    (15)     585      (7)
T_WCS_ERR                         0000039F-R   234    (4)
T_XFC                             000005C7-R   265    (4)      363     (5)
T_XOR                             000008F2-R   325    (4)      402     (5)
UBI                              =0000000A     90     (2)
V_BAD_MODE                       =00000006     126    (2)
V_BAD_STK                        =00000007     128    (2)
V_CHMX_ERR                       =00000003     120    (2)    #-360     (5)    #-546      (6)
V_DONE                           =00000001     116    (2)    #-356     (5)    #-544      (6)
V_ERROR_FLAG                     =0000000C     138    (2)    #-1023    (11)   #-1131     (12)   #-1238     (13)   #-1345     (14)
                                                             #-1481    (16)   #-1567     (17)   #-1653     (18)   #-1743     (19)
                                                             #-1822    (20)   #-1907     (21)   #-1976     (22)   #-2059     (23)
                                                             #-660     (8)    #-806      (9)    #-920      (10)
V_EXECUTE_ERR                    =00000002     118    (2)    #-358     (5)    #-542      (6)
V_FATAL_ERR                      =00000008     130    (2)    #-1025    (11)   #-1133     (12)   #-1240     (13)   #-1347     (14)
                                                             #-1483    (16)   #-1569     (17)   #-1655     (18)   #-1745     (19)
                                                             #-1824    (20)   #-1909     (21)   #-1978     (22)   #-2061     (23)
                                                             #-664     (8)    #-809      (9)    #-922      (10)
V_GPR_ERR                        =0000000A     134    (2)    #-393     (5)
V_ISP_ERR                        =0000000E     142    (2)    #-370     (5)
V_ISTK                           =00000010     146    (2)    #-364     (5)    #-369      (5)    #-522      (6)
V_KSP_ERR                        =0000000D     140    (2)    #-365     (5)
V_MCHK_FLAG                      =00000011     148    (2)
V_PSL_ERR                        =00000009     132    (2)    #-378     (5)
V_READY                          =00000000     114    (2)    #-354     (5)    #-540      (6)
V_SP_ERR                         =0000000F     144    (2)    #-374     (5)
V_TIMER                          =00000005     124    (2)    #-406     (5)    #-550      (6)
V_USR_WCS                        =00000019     150    (2)    #-2038    (23)
V_XFC                            =0000000B     136    (2)
V_XFC_ERR                        =00000004     122    (2)    #-362     (5)    #-548      (6)
WCS                              =00000007     90     (2)
XFC_ERROR                         00000C6C-R   485    (6)      1805    (20)
XFC_SERVICE                       00000C78-R   494    (6)      1885    (21)     2042     (23)     766      (9)      890      (10)
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                                              +-------------------------+
                                              ! Macros Cross Reference  !
                                              +-------------------------+
MACRO            SIZE        DEFINITION          REFERENCES...
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$D1_ABPROGRAM    1           663    (8)          1000    (11)        1026    (11)        1108    (12)        1134    (12)        1215    (13)
                                                 1241    (13)        1322    (14)        1348    (14)        1484    (16)        1570    (17)
                                                 1656    (18)        1746    (19)        1825    (20)        1910    (21)        1979    (22)
                                                 2062    (23)        663     (8)         665     (8)         756     (9)         764     (9)
                                                 780     (9)         808     (9)         810     (9)         814     (9)         887     (10)
                                                 923     (10)
$D1_BSUBT        1           640    (8)          1095    (12)        1202    (13)        1309    (14)        1454    (16)        1540    (17)
                                                 1626    (18)        1712    (19)        1802    (20)        1882    (21)        1954    (22)
                                                 2036    (23)        640     (8)         748     (9)         876     (10)        987     (11)
$D1_BTEST        1           575    (7)          1376    (15)        575     (7)
$D1_ERR          1           661    (8)          1024    (11)        1107    (12)        1132    (12)        1214    (13)        1239    (13)
                                                 1321    (14)        1346    (14)        1482    (16)        1568    (17)        1654    (18)
                                                 1744    (19)        1823    (20)        1908    (21)        1977    (22)        2060    (23)
                                                 661     (8)         755     (9)         763     (9)         779     (9)         807     (9)
                                                 813     (9)         886     (10)        921     (10)        999     (11)
$D1_ERR_S        1           661    (8)          1024    (11)        1107    (12)        1132    (12)        1214    (13)        1239    (13)
                                                 1321    (14)        1346    (14)        1482    (16)        1568    (17)        1654    (18)
                                                 1744    (19)        1823    (20)        1908    (21)        1977    (22)        2060    (23)
                                                 661     (8)         755     (9)         763     (9)         779     (9)         807     (9)
                                                 813     (9)         886     (10)        921     (10)        999     (11)
$D1_ESUBT        1           666    (8)          1029    (11)        1137    (12)        1244    (13)        1351    (14)        1486    (16)
                                                 1572    (17)        1658    (18)        1748    (19)        1827    (20)        1912    (21)
                                                 1981    (22)        2064    (23)        666     (8)         817     (9)         926     (10)
$D1_ETEST        1           1353   (14)         1353    (14)        2067    (23)
$D1_EXTEST       1           580    (7)          1381    (15)        1394    (15)        2039    (23)        580     (7)         593     (7)
$D1_PRINT_S      1           352    (5)          1004    (11)        1005    (11)        1112    (12)        1113    (12)        1219    (13)
                                                 1220    (13)        1326    (14)        1327    (14)        1380    (15)        1386    (15)
                                                 1393    (15)        1462    (16)        1463    (16)        1548    (17)        1549    (17)
                                                 1634    (18)        1635    (18)        1720    (19)        1721    (19)        1809    (20)
                                                 1810    (20)        1890    (21)        1891    (21)        1963    (22)        1964    (22)
                                                 2046    (23)        2047    (23)        352     (5)         353     (5)         355     (5)
                                                 357     (5)         359     (5)         361     (5)         363     (5)         366     (5)
                                                 368     (5)         371     (5)         373     (5)         375     (5)         377     (5)
                                                 383     (5)         387     (5)         392     (5)         394     (5)         402     (5)
                                                 404     (5)         407     (5)         579     (7)         585     (7)         592     (7)
                                                 646     (8)         647     (8)         771     (9)         772     (9)         895     (10)
                                                 896     (10)
$D1_SBTTL        2           556    (7)          1033    (12)        1140    (13)        1247    (14)        1357    (15)        1403    (16)
                                                 1489    (17)        1575    (18)        1661    (19)        1751    (20)        1830    (21)
                                                 1915    (22)        1984    (23)        556     (7)         602     (8)         669     (9)
                                                 820     (10)        929     (11)
$D2_BDATA        1           575    (7)          1376    (15)        575     (7)
$D2_BTEST        1           575    (7)          1376    (15)        575     (7)
$D2_SBTTL        1           556    (7)          1357    (15)        556     (7)
$DEF             1           88     (2)          82      (2)         85      (2)         87      (2)
$DEFEND          1           82     (2)          82      (2)         85      (2)         86      (2)         87      (2)
$DEFINI          1           82     (2)          82      (2)         85      (2)         86      (2)         87      (2)
$DS_ABORT        1           663    (8)          1000    (11)        1026    (11)        1108    (12)        1134    (12)        1215    (13)
                                                 1241    (13)        1322    (14)        1348    (14)        1484    (16)        1570    (17)
                                                 1656    (18)        1746    (19)        1825    (20)        1910    (21)        1979    (22)
```

```
                                                              I  7
ZZ-ENKAX-1.3    Cross reference                           3-AUG-1983         Fiche 2  Frame I7         Sequence 292
ENKAXD                          VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:43:40  VAX-11 Macro V03-00          Page  84
Cross reference                                                           3-AUG-1983 09:57:17  WRKD$0:[PAN.ENKAX]ENKAXD.MAR;75  (23)

                                              2062    (23)    663     (8)     665     (8)     756     (9)     764     (9)
                                              780     (9)     808     (9)     810     (9)     814     (9)     887     (10)
                                              923     (10)
$DS_ASKLGCL_S       1         587     (7)     1388    (15)    587     (7)
$DS_BCOMPLETE       1         662     (8)     662     (8)     754     (9)     778     (9)     812     (9)
$DS_BGNMESSAGE      1         349     (5)     349     (5)
$DS_BGNMOD          1         67      (2)     67      (2)
$DS_BGNSUB          1         640     (8)     1095    (12)    1202    (13)    1309    (14)    1454    (16)    1540    (17)
                                              1626    (18)    1712    (19)    1802    (20)    1882    (21)    1954    (22)
                                              2036    (23)    640     (8)     748     (9)     876     (10)    987     (11)
$DS_BGNTEST         1         575     (7)     1376    (15)    575     (7)
$DS_BREAK           1         1353    (14)    1353    (14)    2067    (23)
$DS_CLRVEC_S        1         765     (9)     1027    (11)    1028    (11)    1135    (12)    1136    (12)    1242    (13)
                                              1243    (13)    1349    (14)    1350    (14)    1352    (14)    1485    (16)
                                              1571    (17)    1657    (18)    1747    (19)    1826    (20)    1911    (21)
                                              1980    (22)    2063    (23)    2066    (23)    765     (9)     816     (9)
                                              888     (10)    925     (10)
$DS_CVTREG_S        1         380     (5)     380     (5)     384     (5)     389     (5)
$DS_DSADEF          1         87      (2)     87      (2)
$DS_DSBDEF          1         87      (2)
$DS_DSDEF           2         83      (2)     83      (2)
$DS_DSSDEF          1         85      (2)     85      (2)
$DS_ENDDATA         1         575     (7)     1376    (15)    575     (7)
$DS_ENDMESSAGE      1         409     (5)     409     (5)
$DS_ENDMOD          1         2070    (23)    2070    (23)
$DS_ENDSUB          1         666     (8)     1029    (11)    1137    (12)    1244    (13)    1351    (14)    1486    (16)
                                              1572    (17)    1658    (18)    1748    (19)    1827    (20)    1912    (21)
                                              1981    (22)    2064    (23)    666     (8)     817     (9)     926     (10)
$DS_ENDTEST         1         1353    (14)    1353    (14)    2067    (23)
$DS_ENVDEF          2         67      (2)     67      (2)
$DS_ERRDEF          1         84      (2)     84      (2)
$DS_ERRHARD_S       1         661     (8)     1024    (11)    1107    (12)    1132    (12)    1214    (13)    1239    (13)
                                              1321    (14)    1346    (14)    1482    (16)    1568    (17)    1654    (18)
                                              1744    (19)    1823    (20)    1908    (21)    1977    (22)    2060    (23)
                                              661     (8)     763     (9)     807     (9)     886     (10)    921     (10)
                                              999     (11)
$DS_ERRSYS_S        1         755     (9)     755     (9)     779     (9)     813     (9)
$DS_EXIT            1         580     (7)     1381    (15)    1394    (15)    2039    (23)    580     (7)     593     (7)
$DS_MMOFF_S         1         815     (9)     815     (9)     924     (10)
$DS_MMON_S          1         752     (9)     752     (9)     879     (10)
$DS_PAGE            1         554     (6)     1030    (11)    1138    (12)    1245    (13)    1354    (14)    1401    (15)
                                              1487    (16)    1573    (17)    1659    (18)    1749    (19)    1828    (20)
                                              1913    (21)    1982    (22)    2068    (23)    554     (6)     600     (7)
                                              667     (8)     818     (9)     927     (10)
$DS_PARDEF          1         88      (2)     88      (2)
$DS_PRINTB_S        1         352     (5)     352     (5)     353     (5)     355     (5)     357     (5)     359     (5)
                                              361     (5)     363     (5)     366     (5)     371     (5)     375     (5)
                                              383     (5)     387     (5)     394     (5)     402     (5)     407     (5)
$DS_PRINTF_S        1         579     (7)     1004    (11)    1005    (11)    1112    (12)    1113    (12)    1219    (13)
                                              1220    (13)    1326    (14)    1327    (14)    1380    (15)    1386    (15)
                                              1393    (15)    1462    (16)    1463    (16)    1548    (17)    1549    (17)
                                              1634    (18)    1635    (18)    1720    (19)    1721    (19)    1809    (20)
                                              1810    (20)    1890    (21)    1891    (21)    1963    (22)    1964    (22)
                                              2046    (23)    2047    (23)    579     (7)     585     (7)     592     (7)
                                              646     (8)     647     (8)     771     (9)     772     (9)     895     (10)
                                              896     (10)
$DS_PRINTX_S        1         368     (5)     368     (5)     373     (5)     377     (5)     392     (5)     404     (5)
```

```
                                                              J  7
ZZ-ENKAX-1.3     Cross reference                          3-AUG-1983           Fiche 2  Frame J7          Sequence 293
ENKAXD                              VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:43:40  VAX-11 Macro V03-00            Page  85
Cross reference                                                                3-AUG-1983 09:57:17  WRKD$0:[PAN.ENKAX]ENKAXD.MAR;75   (23)

$DS_PSLDEF          1              86       (2)         86       (2)
$DS_SBTTL           1              556      (7)         1033     (12)       1140     (13)       1247     (14)       1357     (15)       1403     (16)
                                                        1489     (17)       1575     (18)       1661     (19)       1751     (20)       1830     (21)
                                                        1915     (22)       1984     (23)       556      (7)        602      (8)        669      (9)
                                                        820      (10)       929      (11)
$DS_SCBDEF          1              82       (2)         82       (2)
$DS_SECDEF          1              90       (2)         90       (2)
$DS_SETVEC_S        1              598      (7)         1098     (12)       1099     (12)       1205     (13)       1206     (13)       1312     (14)
                                                        1313     (14)       1399     (15)       1457     (16)       1543     (17)       1629     (18)
                                                        1715     (19)       1805     (20)       1885     (21)       2042     (23)       598      (7)
                                                        757      (9)        766      (9)        880      (10)       890      (10)       990      (11)
                                                        991      (11)
$EQU                1              88       (2)         67       (2)        83       (2)        86       (2)        88       (2)
$EQULS1             1              86       (2)         67       (2)        83       (2)        86       (2)
$EQULST             1              67       (2)         67       (2)        83       (2)        86       (2)
$GBLINI             2              67       (2)         67       (2)        82       (2)        83       (2)        85       (2)        86       (2)
                                                        87       (2)        88       (2)
$OFFDEF             1              84       (2)         84       (2)
$PSLDEF             1              86       (2)         86       (2)
$PUSHADR            1              382      (5)         1024     (11)       1107     (12)       1132     (12)       1214     (13)       1239     (13)
                                                        1321     (14)       1346     (14)       1391     (15)       1482     (16)       1568     (17)
                                                        1654     (18)       1744     (19)       1823     (20)       1908     (21)       1977     (22)
                                                        2060     (23)       382      (5)        386      (5)        391      (5)        590      (7)
                                                        661      (8)        753      (9)        755      (9)        763      (9)        777      (9)
                                                        779      (9)        807      (9)        811      (9)        813      (9)        886      (10)
                                                        921      (10)       999      (11)
$SETPRT_S           1              753      (9)         753      (9)        777      (9)        811      (9)
$VIELD              1              67       (2)         67       (2)        86       (2)        87       (2)        88       (2)
$VIELD1             1              88       (2)         67       (2)        86       (2)        87       (2)        88       (2)
ENKAX_SECDEF        1              90       (2)         90       (2)

                                                  +--------------------------+
                                                  ! Performance indicators  !
                                                  +--------------------------+

Phase                       Page faults   CPU Time        Elapsed Time
-----                       -----------   --------        ------------
Initialization                       25   00:00:00.05     00:00:00.27
Command processing                   25   00:00:00.23     00:00:01.04
Pass 1                             1939   00:00:32.09     00:02:07.40
Symbol table sort                     1   00:00:00.91     00:00:02.32
Pass 2                             1413   00:00:09.75     00:00:39.59
Symbol table output                  27   00:00:00.41     00:00:01.53
Psect synopsis output                 3   00:00:00.02     00:00:00.10
Cross-reference output              258   00:00:04.63     00:00:13.09
Assembler run totals               3695   00:00:48.10     00:03:05.34

The working set limit was 1000 pages.
363263 bytes (710 pages) of virtual memory were used to buffer the intermediate code.
There were 40 pages of symbol table space allocated to hold 576 non-local and 167 local symbols.
2071 source lines were read in Pass 1, producing 52 object records in Pass 2.
116 pages of virtual memory were used to define 56 macros.
```

```
                                          +-----------------------------+
                                          ! Macro library statistics !
                                          +-----------------------------+
Macro library name                        Macros defined
------------------                        --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                         1
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                      48
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                      9
TOTALS (all libraries)                                58

842 GETS were required to define 58 macros.

There were no errors, warnings or information messages.

/LIS/CRO ENKAXD
```

Table of contents

```
    (1)        1        ENKAXE: WRITABLE CONTROL STORE
    (2)       56        DECLARATIONS
    (3)       94        SUBROUTINES
    (5)      100        ERROR MESSAGES
    (7)      106        ERROR REPORTING ROUTINES
    (8)      112        TEST 5:  Writable Control Store Test <NY
    (9)      124        SUBTEST 5.1:
    (10)     144        SUBTEST 5.2:
    (11)     161        SUBTEST 5.3:
```

```
0000            .SBTTL  ENKAXE: WRITABLE CONTROL STORE
0000            .TITLE  ENKAXE  VAX-11/730 Specific CPU Cluster Exerciser
0000            .IDENT  /1.2/
0000
0000      ;
0000      ; Copyright (C) 1980
0000      ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000      ;
0000      ; This software is furnished  under a license for use only on a single
0000      ; computer  system and  may be  copied only with  the inclusion of the
0000      ; above copyright notice.  This software, or any other copies thereof,
0000      ; may not be provided or  otherwise made available to any other person
0000      ; except for use on such system and to one who agrees to these license
0000      ; terms.  Title to and  ownership of the  software  shall at all times
0000      ; remain in DEC.
0000      ;
0000      ; The information in this software is subject to change without notice
0000      ; and should  not be construed  as a commitment  by Digital  Equipment
0000      ; Corporation.
0000      ;
0000      ; DEC assumes  no  responsibility  for  the use or  reliability of its
0000      ; software on equipment which is not supplied by DEC.
0000      ;
0000
0000      ;++
0000      ; Facility:      VAX Architecture Diagnostic.
0000      ;
0000      ; Abstract:      It was agreed at the Nebula functional specification review
0000      ;                that this module will not be implemented for the VAX 11/730
0000      ;                due to the requirements to load WCS with executable code
0000      ;                and the inablity for a MACRO program to access WCS.
0000      ;                To implement this test would require a special TU58 micro
0000      ;                code tape with an additional file containing any micro code
0000      ;                that would be used in this test. If WCS were accessible to
0000      ;                a MACRO program, as it is in the VAX 11/780 and VAX 11/750,
0000      ;                this test would be more feasible.
0000      ;
0000      ; Environment:   VAX Diagnostic Supervisor.
0000      ;
0000      ; Author:        Rich Lewis      13-Dec-80        Version 1X
0000      ;
0000      ;                Tai-Chun Pan    01-Apr-83        Version 1.2
0000      ;
0000      ;                Added quick flag on Test 7(TU58). If quick flag is set
0000      ;                will skip subtest 4 through subtest 11.  Added event flag 3.
0000      ;                If event flag 3 is set, will override protection,
0000      ;                i.e., go ahead and write on tape.  If run APT & event flag 3
0000      ;                is clear & tape is not scratch, will report an error.
0000      ;
0000      ;                Modified Unibus sizer on Test 8 & 9. make test run faster.
0000      ;
0000      ;
0000      ;
0000      ;--
```

```
                    0000     56              .SBTTL  DECLARATIONS
                    0000     57              .LIST   MEB
                    0000     58              .NLIST  CND
                00000000     59              .PSECT  ENKAXE, PAGE, NOWRT
                    0000     60              .LIBRARY        "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                    0000     61              $DS_BGNMOD      CEP_REPAIR, TN=5
                    0000        ;;;          Macro-32 Diagnostic macro library Version 6.10 'DIAG.MLB (137)"
                    0000     62
                    0000     63 ;
                    0000     64 ; Include files:
                    0000     65 ;
                    0000     66
                    0000     67              .LIBRARY        "ENKAX"         ; CPU Cluster Exerciser library.
                    0000     68
                    0000     72
                    0000     73              $DS_SCBDEF
                    0000     74              $DS_DSADEF
                    0000     75              $DS_DSDEF
                    0000     76              $DS_PARDEF
                    0000     77              $DS_PSLDEF
                    0000     78              $DS_ERRDEF
                    0000     79              $DS_DSSDEF
                    0000     80              $DS_HPODEF
                    0000     81              $DS_KA_DEF
                    0000     82              ENKAX_SECDEF
                    0000     83
                    0000     84 ;
                    0000     85 ; Own storage:
                    0000     86 ;
                    0000     87
                    0000     88
                    0000     89
```

```
ZZ-ENKAX-1.3    SUBROUTINES                                        30-JUN-1983         Fiche 2  Frame B8          Sequence 298
ENKAXE                            VAX-11/730 Specific CPU Cluster Exercise 30-JUN-1983 15:49:41  VAX-11 Macro V03-00        Page   3
1.2                               SUBROUTINES                               1-APR-1983 15:16:53  WRKD$0:[PAN.ENKAX]ENKAXE.MAR;71   (3)

                                  0000     94 .SBTTL  SUBROUTINES
                                  0000     95
                                  0000     96
                                  0000     97
```

```
                                0000    99
                                0000   100 .SBTTL  ERROR MESSAGES
                                0000   101
                                0000   102 ;-----------------------------------------------------------------------------------
                                0000   103
```

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```

```
                              0000    105
                              0000    106 .SBTTL  ERROR REPORTING ROUTINES
                              0000    107
                              0000    108 ;--------------------------------------------------------------------------------
                              0000    109
                              0000    110         $DS_PAGE
```

```
                     0000                 .SBTTL  TEST 5:  Writable Control Store Test <NYI>
                 00000000                 .PSECT  TEST_005, PAGE, NOWRT
                     0028
                     0028   113 ; ++
                     0028   114 ; Test description:
                     0028   115 ;
                     0028   116 ;
                     0028   117 ;
                     0028   118 ;--
                     0028   119
                     0028   120         $DS_BGNTEST     <WCS,DEFAULT,ALL>
                     0028       DATA_005:
          00000000   0028                 .LONG   0               ; TEST ARGUMENT TABLE TERMINATOR
                     002C       TEST_005::
              0000   002C                 .WORD   ^M<>            ; ENTRY MASK
                     002E   121
                     002E   122         $DS_PAGE
```

```
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```

```
                                        002E            .SBTTL  SUBTEST 5.1:
                                        002E     125 ; +
                                        002E     126 ; Subtest description:
                                        002E     127 ;
                                        002E     128 ;
                                        002E     129 ; Subtest steps:
                                        002E     130 ;
                                        002E     131 ;
                                        002E     132 ; Errors:
                                        002E     133 ;
                                        002E     134 ;
                                        002E     135 ;-
                                        002E     136
                                        002E     137
                                        002E     138            $DS_BGNSUB
                                        002E         T5_S1::
    00010030 9F     00000000'EF     FA  002E                            CALLG   $S$, @#DS$BGNSUB
                                        0039     139
                                        0039     140            $DS_ENDSUB
                                        0039         T5_S1_X:
    00010038 9F     00000000'EF     FA  0039                            CALLG   $S$, @#DS$ENDSUB
                                        0044     141
                                        0044     142            $DS_PAGE
```

```
                                    0044            .SBTTL  SUBTEST 5.2:
                                    0044   145 ; +
                                    0044   146 ; Subtest description:
                                    0044   147 ;
                                    0044   148 ;
                                    0044   149 ; Subtest steps:
                                    0044   150 ;
                                    0044   151 ;
                                    0044   152 ; Errors:
                                    0044   153 ;
                                    0044   154 ;-
                                    0044   155            $DS_BGNSUB
                                    0044       T5_S2::
00010030 9F    0000000C'EF     FA   0044                  CALLG   $S$, @#DS$BGNSUB
                                    004F   156
                                    004F   157            $DS_ENDSUB
                                    004F       T5_S2_X:
00010038 9F    0000000C'EF     FA   004F                  CALLG   $S$, @#DS$ENDSUB
                                    005A   158
                                    005A   159            $DS_PAGE
```

```
                                     005A                 .SBTTL  SUBTEST 5.3:
                                     005A     162 ; +
                                     005A     163 ; Subtest description:
                                     005A     164 ;
                                     005A     165 ;
                                     005A     166 ; Subtest steps:
                                     005A     167 ;
                                     005A     168 ; Errors:
                                     005A     169 ;
                                     005A     170 ;-
                                     005A     171
                                     005A     172
                                     005A     173         $DS_BGNSUB
                                     005A         T5_S3::
    00010030 9F    00000018'EF   FA  005A                     CALLG   $S$, @#DS$BGNSUB
                                     0065     174
                                     0065     175         $DS_ENDSUB
                                     0065         T5_S3_X:
    00010038 9F    00000018'EF   FA  0065                     CALLG   $S$, @#DS$ENDSUB
                                     0070     176
                                     0070     177         $DS_ENDTEST
                     50     01   D0  0070                     MOVL    #1, R0            ; NORMAL EXIT
                                     0073         TEST_005_X::
            00010058 9F     6E   FA  0073                     CALLG   (SP), @#DS$BREAK
                                 04  007A                     RET                       ; RETURN TO TEST SEQUENCER
                                     007B     178
                                     007B     179         $DS_ENDMOD
                                 00000000                     .PSECT  $TSTCNT, NOEXE, NOWRT, OVR, LONG
                         00000005    0000                     .LONG   $TN
                                     0004     180         .END
```

```
                                                                        I  8
ZZ-ENKAX-1.3    Symbol table                                       30-JUN-1983            Fiche 2  Frame I8            Sequence 305
ENKAXE                          VAX-11/730 Specific CPU Cluster Exercise 30-JUN-1983 15:49:41   VAX-11 Macro V03-00            Page  10
Symbol table                                                             1-APR-1983 15:16:53   WRKD$0:[PAN.ENKAX]ENKAXE.MAR;71  (11)

$$$                                 = 00000018 R      06        DS$K_SUBSYS                      = 00000066
$$ARGS                              = 0000000A                  DS$K_WARNING                     = 00000000
$$E                                 = 00000001                  DS$LOAD                            00010198
$$M                                 = 00000181                  DS$LOADPCS                         000101C0
$$N                                 = 00000000                  DS$MAPDBGBLOCK                     00010118
$$S                                 = FFFFFFFF                  DS$MMOFF                           00010158
$$T1                                = 0000002C                  DS$MMON                            00010150
$ENV                                = 00000001  G               DS$MOVPHY                          00010148
$ER                                 = FFFFFFFF                  DS$MOVVRT                          00010140
$MO                                 = 00000001  G               DS$PARSE                           000100B8
$S$                                 = 00000018 R      06        DS$PRINTB                          000100E0
$ST                                 = 00000000                  DS$PRINTF                          000100F0
$TN                                 = 00000005                  DS$PRINTS                          000100F8
ALL                                 = 00000008  G               DS$PRINTSIG                        00010100
BASE_005                              00000000 R      04        DS$PRINTX                          000100E8
BIT...                              = 0000001A                  DS$PROBE                           000101A0
CEP_FUNCTIONAL                      = 00000000                  DS$RELBUF                          00010128
CEP_REPAIR                          = 00000001                  DS$RELMEM                          00010138
CPU$V_COMET                         = 00000002                  DS$SETIPL                          00010178
CPU$V_HS                            = 00000000                  DS$SETMAP                          00010188
CPU$V_STAR                          = 00000001                  DS$SETPRIEXV                       00010110
DATA_005                              00000028 R      04        DS$SETVEC                          00010160
DEFAULT                             = 00000000  G               DS$SHOCHAN                         00010190
DS$ABORT                              00010020                  DS$SUMMARY                         00010028
DS$ASKADR                             00010090                  DS$WAITMS                          00010060
DS$ASKDATA                            00010080                  DS$WAITUS                          00010068
DS$ASKLGCL                            00010098                  DS$_ARITH                        = 006600D0
DS$ASKSTR                             000100A0                  DS$_BADLINK                      = 006600F0
DS$ASKVLD                             00010088                  DS$_BADTYPE                      = 006600E8
DS$ATTACH                             000101A8                  DS$_CHME                         = 006600A8
DS$BGNSUB                             00010030                  DS$_CHMK                         = 006600E0
DS$BRANCH                             000100A8                  DS$_DEVNAME                      = 00660108
DS$BREAK                              00010058                  DS$_ERROR                        = 00660002
DS$CANWAIT                            00010070                  DS$_FHWE                         = 00660068
DS$CHANNEL                            00010180                  DS$_FRAGBUF                      = 00660080
DS$CKLOOP                             00010040                  DS$_ICBUSY                       = 006600C8
DS$CLRVEC                             00010168                  DS$_ICERR                        = 006600C0
DS$CNTRLC                             00010078                  DS$_IHWE                         = 00660060
DS$CVTREG                             000100B0                  DS$_ILLCHAR                      = 00660018
DS$ENDPASS                            00010010                  DS$_ILLPAGCNT                    = 00660078
DS$ENDSUB                             00010038                  DS$_ILLUNIT                      = 00660100
DS$ERRDEV                             000100C8                  DS$_INSFMEM                      = 00660050
DS$ERRHARD                            000100D0                  DS$_IPL2HI                       = 006600B8
DS$ERRPREP                            00010108                  DS$_IVADDR                       = 00660040
DS$ERRSOFT                            000100D8                  DS$_IVVECT                       = 00660038
DS$ERRSYS                             000100C0                  DS$_KRNLSTK                      = 00660090
DS$ESCAPE                             00010050                  DS$_LOGIC                        = 00660070
DS$FREEDBGSYM                         000101B8                  DS$_MCHK                         = 00660088
DS$GETBUF                             00010120                  DS$_MMOFF                        = 00660058
DS$GETMEM                             00010130                  DS$_NEEDUNIT                     = 006600F8
DS$GPHARD                             00010018                  DS$_NOPCS                        = 00660110
DS$HELP                               000101B0                  DS$_NORMAL                       = 00660001
DS$INITSCB                            00010170                  DS$_NOSUPPORT                    = 006600B1
DS$INLOOP                             00010048                  DS$_NOTDON                       = 00660030
DS$K_ERROR                          = 00000002                  DS$_NOTIMP                       = 006600B0
DS$K_NORMAL                         = 00000001                  DS$_NULLSTR                      = 00660010
DS$K_SEVERE                         = 00000004                  DS$_OVERFLOW                     = 00660008
```

```
DS$_POWER                       = 00660098          DSA$V_IE1                          = 00000004
DS$_PROGERR                     = 00660020          DSA$V_IE2                          = 00000005
DS$_SEVERE                      = 00660004          DSA$V_IE3                          = 00000006
DS$_TRANSL                      = 006600A0          DSA$V_IES                          = 00000007
DS$_TRUNCATE                    = 00660028          DSA$V_LOAD_DEBUGGER                = 0000001E
DS$_UNEXPINT                    = 006600D8          DSA$V_LOOP                         = 00000002
DS$_VASFULL                     = 00660048          DSA$V_NORPT                        = 0000001B
DS$_WARNING                     = 00660000          DSA$V_OPER                         = 0000000C
DSA$AL_APTMAIL                    0000FE00          DSA$V_PASSO                        = 0000001D
DSA$AT_APTTXT                     0000FA00          DSA$V_PROMPT                       = 0000000D
DSA$GL_APTCOM                     0000FE04          DSA$V_QA                           = 0000000F
DSA$GL_DEVLEN                     0000FE58          DSA$V_QUICK                        = 00000008
DSA$GL_ERRNO                      0000FE44          DSA$V_SEARCH                       = 0000000E
DSA$GL_EVENT                      0000FE48          DSA$V_TRACE                        = 0000000A
DSA$GL_FLAGS                      0000FE00          DSA$V_USER                         = 0000001C
DSA$GL_MSGTYP                     0000FE40          DSA$V_VERIFY                       = 00000009
DSA$GL_PASSES                     0000FE08          ENV$M_DOMAIN                       = 00000002
DSA$GL_PASSNO                     0000FE54          ENV$M_LEVEL                        = 00000001
DSA$GL_SECTNO                     0000FE10          ENV$M_SUPER                        = 000003FC
DSA$GL_SID                        0000FE14          ENV$S_DOMAIN                       = 00000001
DSA$GL_SUBTNO                     0000FE4C          ENV$S_LEVEL                        = 00000001
DSA$GL_TESTNO                     0000FE50          ENV$S_SUPER                        = 00000008
DSA$GL_UNITS                      0000FE0C          ENV$V_DOMAIN                       = 00000001
DSA$GQ_MSGPTR                     0000FE68          ENV$V_LEVEL                        = 00000000
DSA$GT_DEVNAM                     0000FE5C          ENV$V_SUPER                        = 00000002
DSA$M_APT                       = 80000000          ENV$_CPU                           = 00000000
DSA$M_BELL                      = 00000008          ENV$_FUNCTIONAL                    = 00000000
DSA$M_BINARY                    = 00000002          ENV$_REPAIR                        = 00000001
DSA$M_CRD_AUTOTEST              = 00000800          ENV$_SUPER                         = 00000001
DSA$M_CRD_MENUTEST              = 00010000          ENV$_SYSTEM                        = 00000001
DSA$M_CRD_TRACE                 = 00020000          ERR$_MSGADR                        = 0000000C
DSA$M_DEBUG                     = 04000000          ERR$_NARGS                         = 0000000A
DSA$M_HALT                      = 00000001          ERR$_NUM                           = 00000004
DSA$M_IE1                       = 00000010          ERR$_P1                            = 00000014
DSA$M_IE2                       = 00000020          ERR$_P2                            = 00000018
DSA$M_IE3                       = 00000040          ERR$_P3                            = 0000001C
DSA$M_IES                       = 00000080          ERR$_P4                            = 00000020
DSA$M_LOAD_DEBUGGER             = 40000000          ERR$_P5                            = 00000024
DSA$M_LOOP                      = 00000004          ERR$_P6                            = 00000028
DSA$M_NORPT                     = 08000000          ERR$_POINTER                       = 00000010
DSA$M_OPER                      = 00001000          ERR$_UNIT                          = 00000008
DSA$M_PASSO                     = 20000000          HALT                               = 00000004   G
DSA$M_PROMPT                    = 00002000          HP$A_DEPENDENT                       00000032
DSA$M_QA                        = 00008000          HP$A_DEVICE                          00000018
DSA$M_QUICK                     = 00000100          HP$A_DVA                             0000001C
DSA$M_SEARCH                    = 00004000          HP$A_LINK                            00000020
DSA$M_TRACE                     = 00000400          HP$B_DRIVE                           0000000B
DSA$M_USER                      = 10000000          HP$B_FLAGS                           0000000A
DSA$M_VERIFY                    = 00000200          HP$M_ALLOC                         = 00000001
DSA$V_APT                       = 0000001F          HP$M_WASALL                        = 00000002
DSA$V_BELL                      = 00000003          HP$Q_DEVICE                          00000000
DSA$V_BINARY                    = 00000001          HP$T_DEVICE                          0000000C
DSA$V_CRD_AUTOTEST              = 0000000B          HP$T_TYPE                            00000026
DSA$V_CRD_MENUTEST              = 00000010          HP$V_ALLOC                         = 00000000
DSA$V_CRD_TRACE                 = 00000011          HP$V_WASALL                        = 00000001
DSA$V_DEBUG                     = 0000001A          HP$W_SIZE                            00000008
DSA$V_HALT                      = 00000000          HP$W_VECTOR                          00000024
```

```
IPR                              = 00000006   G            PSL$C_KERNEL                     = 00000000
KA$B_ACC_TYPE                      00000042                PSL$C_SUPER                      = 00000002
KA$B_RESERVED                      00000043                PSL$C_USER                       = 00000003
KA$B_SID_TYPE                      0000003D                PSL$K_EXEC                       = 00000001
KA$K_LEN                           00000046                PSL$K_KERNEL                     = 00000000
KA$L_FLAGS                         00000032                PSL$K_SUPER                      = 00000002
KA$L_SID                           0000003A                PSL$K_USER                       = 00000003
KA$M_CHAR                        = 00000100                PSL$M_C                          = 00000001
KA$M_CRC                         = 00000010                PSL$M_CBIT                       = 00000001
KA$M_D_FLOAT                     = 00000002                PSL$M_CM                         = 80000000
KA$M_EDIT                        = 00000080                PSL$M_CURMOD                     = 03000000
KA$M_F_FLOAT                     = 00000001                PSL$M_DV                         = 00000080
KA$M_G_FLOAT                     = 00000004                PSL$M_FPD                        = 08000000
KA$M_H_FLOAT                     = 00000008                PSL$M_FU                         = 00000040
KA$M_PACKED                      = 00000020                PSL$M_IPL                        = 001F0000
KA$M_PACK_MUL                    = 00000040                PSL$M_IS                         = 04000000
KA$M_SB_ERR                      = 02000000                PSL$M_IV                         = 00000020
KA$M_TODR                        = 00010000                PSL$M_N                          = 00000008
KA$M_WCS_LD                      = 01000000                PSL$M_NBIT                       = 00000008
KA$V_CHAR                        = 00000008                PSL$M_PRVMOD                     = 00C00000
KA$V_CRC                         = 00000004                PSL$M_SAFBITS                    = 000037FF
KA$V_D_FLOAT                     = 00000001                PSL$M_TBIT                       = 00000010
KA$V_EDIT                        = 00000007                PSL$M_TP                         = 40000000
KA$V_F_FLOAT                     = 00000000                PSL$M_V                          = 00000002
KA$V_G_FLOAT                     = 00000002                PSL$M_VBIT                       = 00000002
KA$V_H_FLOAT                     = 00000003                PSL$M_Z                          = 00000004
KA$V_PACKED                      = 00000005                PSL$M_ZBIT                       = 00000004
KA$V_PACK_MUL                    = 00000006                PSL$S_CURMOD                     = 00000002
KA$V_SB_ERR                      = 00000019                PSL$S_IPL                        = 00000005
KA$V_TODR                        = 00000010                PSL$S_PRVMOD                     = 00000002
KA$V_WCS_LD                      = 00000018                PSL$V_C                          = 00000000
KA$W_LATENCY                       0000003E                PSL$V_CBIT                       = 00000000
KA$W_MEM_SIZE                      00000044                PSL$V_CM                         = 0000001F
KA$W_PROGRESS                      00000040                PSL$V_CURMOD                     = 00000018
KA$W_RESERVED                      00000038                PSL$V_DV                         = 00000007
KA$W_WCS                           00000036                PSL$V_FPD                        = 0000001B
LDPCTX                           = 0000000B   G            PSL$V_FU                         = 00000006
MANUAL                           = 00000001   G            PSL$V_IPL                        = 00000010
MCHK                             = 00000005   G            PSL$V_IS                         = 0000001A
MEM                              = 00000009   G            PSL$V_IV                         = 00000005
MSG_005                            00000002 R       04     PSL$V_N                          = 00000003
PAR$M_ATDEF                      = 00000010                PSL$V_NBIT                       = 00000003
PAR$M_ATHI                       = 00000008                PSL$V_PRVMOD                     = 00000016
PAR$M_ATLO                       = 00000004                PSL$V_TBIT                       = 00000004
PAR$M_NODEF                      = 00000002                PSL$V_TP                         = 0000001E
PAR$V_ATDEF                      = 00000004                PSL$V_V                          = 00000001
PAR$V_ATHI                       = 00000003                PSL$V_VBIT                       = 00000001
PAR$V_ATLO                       = 00000002                PSL$V_Z                          = 00000002
PAR$V_NODEF                      = 00000001                PSL$V_ZBIT                       = 00000002
PAR$_BIN                         = 00000002                SCB$L_ACCESS                       00000020
PAR$_DEC                         = 0000000A                SCB$L_ARITH                        00000034
PAR$_HEX                         = 00000010                SCB$L_BREAK                        0000002C
PAR$_NO                          = 00000000                SCB$L_CHME                         00000044
PAR$_OCT                         = 00000008                SCB$L_CHMK                         00000040
PAR$_YES                         = 00000001                SCB$L_CHMS                         00000048
POWER                            = 00000003   G            SCB$L_CHMU                         0000004C
PSL$C_EXEC                       = 00000001                SCB$L_COMPAT                       00000030
```

```
SCB$L_KNLSTK                 00000008          SYS$SETIMR                   00010420
SCB$L_MACHCHK                00000004          SYS$SETPRI                   00010428
SCB$L_OPCCUS                 00000014          SYS$SETPRT                   00010430
SCB$L_OPCDEC                 00000010          SYS$SETRWM                   00010438
SCB$L_POWER                  0000000C          SYS$SETSWM                   00010448
SCB$L_RADRMOD                0000001C          SYS$ULKPAG                   00010460
SCB$L_ROPRAND                00000018          SYS$ULWSET                   00010468
SCB$L_RXDB                   000000F8          SYS$UNWIND                   00010470
SCB$L_SFTLVL1                00000084          SYS$WAITFR                   00010478
SCB$L_SFTLVL10               000000A8          SYS$WFLAND                   00010488
SCB$L_SFTLVL11               000000AC          SYS$WFLOR                    00010490
SCB$L_SFTLVL12               000000B0          T5_S1                        0000002E RG    04
SCB$L_SFTLVL13               000000B4          T5_S1_X                      00000039 R     04
SCB$L_SFTLVL14               000000B8          T5_S2                        00000044 RG    04
SCB$L_SFTLVL15               000000BC          T5_S2_X                      0000004F R     04
SCB$L_SFTLVL2                00000088          T5_S3                        0000005A RG    04
SCB$L_SFTLVL3                0000008C          T5_S3_X                      00000065 R     04
SCB$L_SFTLVL4                00000090          TEST_005                     0000002C RG    04
SCB$L_SFTLVL5                00000094          TEST_005_X                   00000073 RG    04
SCB$L_SFTLVL6                00000098          TU58                       = 00000002  G
SCB$L_SFTLVL7                0000009C          UBI                        = 0000000A  G
SCB$L_SFTLVL8                000000A0          WCS                        = 00000007  G
SCB$L_SFTLVL9                000000A4
SCB$L_TBIT                   00000028
SCB$L_TIMER                  000000C0
SCB$L_TRANSL                 00000024
SCB$L_TXDB                   000000FC
SCB$L_ZERO                   00000000
SEP_FUNCTIONAL             = 00000002
SEP_REPAIR                 = 00000003
SIZ...                     = 00000001
SYS$ALLOC                    00010238
SYS$ASCTIM                   00010248
SYS$ASSIGN                   00010250
SYS$BINTIM                   00010258
SYS$CANCEL                   00010260
SYS$CANTIM                   00010268
SYS$CLOSE                    000105B8
SYS$CLREF                    00010298
SYS$CONNECT                  000105C0
SYS$DALLOC                   000102D8
SYS$DASSGN                   000102E0
SYS$DISCONNECT               000105D0
SYS$FAO                      00010350
SYS$FAOL                     00010358
SYS$GET                      00010580
SYS$GETCHN                   000104C8
SYS$GETTIM                   00010378
SYS$LKWSET                   000103A0
SYS$NUMTIM                   000103B8
SYS$OPEN                     00010608
SYS$QIO                      000103C8
SYS$QIOW                     00010200
SYS$READ                     00010590
SYS$READEF                   000103D0
SYS$SETAST                   000103F8
SYS$SETEF                    00010400
```

```
                                           +-----------------+
                                           ! Psect synopsis !
                                           +-----------------+
PSECT name                     Allocation          PSECT No.  Attributes
----------                     ----------          ---------  ----------
.  ABS  .                      00000000  (     0.)  00 (   0.)  NOPIC    USR    CON    ABS    LCL NOSHR NOEXE NORD    NOWRT NOVEC BYTE
. BLANK .                      00000000  (     0.)  01 (   1.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD      WRT NOVEC BYTE
ENKAXE                         00000000  (     0.)  02 (   2.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD    NOWRT NOVEC PAGE
$ABS$                          00010610  (67088.)  03 (   3.)  NOPIC    USR    CON    ABS    LCL NOSHR   EXE   RD      WRT NOVEC BYTE
TEST_005                       0000007B  (   123.)  04 (   4.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD    NOWRT NOVEC PAGE
DISPATCH                       00000018  (    24.)  05 (   5.)  NOPIC    USR    CON    REL    LCL NOSHR NOEXE   RD    NOWRT NOVEC LONG
ARGLIST                        00000024  (    36.)  06 (   6.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD    NOWRT NOVEC LONG
$TSTCNT                        00000004  (     4.)  07 (   7.)  NOPIC    USR    OVR    REL    LCL NOSHR NOEXE   RD    NOWRT NOVEC LONG
```

```
                                            +--------------------------+
                                            ! Symbol Cross Reference !
                                            +--------------------------+
SYMBOL                          VALUE       DEFINITION      REFERENCES...
------                          -----       ----------      -------------
$$$                             =00000018-R 173      (11)   138      (9)      155      (10)     173      (11)
$$ARGS                          =0000000A   78       (2)    78       (2)
$$E                             =00000001   173      (11)   140      (9)      157      (10)     175      (11)
$$M                             =00000181   120      (8)    120      (8)
$$N                             =00000000   120      (8)    82       (2)
$$S                             =FFFFFFFF   177      (11)   112      (8)      120      (8)      124      (9)      138      (9)
                                                            144      (10)     155      (10)     161      (11)     173      (11)
$$T1                            =0000002C   78       (2)    78       (2)
$ENV                            =00000001   61       (2)
$ER                             =FFFFFFFF   177      (11)   138      (9)      155      (10)     173      (11)
$MO                             =00000001   179      (11)   179      (11)
$S$                             =00000018-R 173      (11)   138      (9)      140      (9)      155      (10)     157      (10)
                                                            173      (11)     175      (11)
$ST                             =00000000   177      (11)   120      (8)      124      (9)      138      (9)      140      (9)
                                                            144      (10)     155      (10)     157      (10)     161      (11)
                                                            173      (11)     175      (11)     177      (11)
$TN                             =00000005   179      (11)   112      (8)      120      (8)      124      (9)      144      (10)
                                                            161      (11)     177      (11)     179      (11)
ALL                             =00000008   82       (2)    120      (8)
BASE_005                         00000000-R 112      (8)    120      (8)
BIT...                          =0000001A   81       (2)    61       (2)      74       (2)      75       (2)      76       (2)
                                                            77       (2)      80       (2)      81       (2)
CEP_FUNCTIONAL                  =00000000   61       (2)
CEP_REPAIR                      =00000001   61       (2)    61       (2)
CPU$V_COMET                     =00000002   74       (2)
CPU$V_HS                        =00000000   74       (2)
CPU$V_STAR                      =00000001   74       (2)
DATA_005                         00000028-R 120      (8)    120      (8)
DEFAULT                         =00000000   82       (2)    120      (8)
DS$ABORT                         00010020   79       (2)
DS$ASKADR                        00010090   79       (2)
DS$ASKDATA                       00010080   79       (2)
DS$ASKLGCL                       00010098   79       (2)
DS$ASKSTR                        000100A0   79       (2)
DS$ASKVLD                        00010088   79       (2)
DS$ATTACH                        000101A8   79       (2)
DS$BGNSUB                        00010030   79       (2)    138      (9)      155      (10)     173      (11)
DS$BRANCH                        000100A8   79       (2)
DS$BREAK                         00010058   79       (2)    177      (11)
DS$CANWAIT                       00010070   79       (2)
DS$CHANNEL                       00010180   79       (2)
DS$CKLOOP                        00010040   79       (2)
DS$CLRVEC                        00010168   79       (2)
DS$CNTRLC                        00010078   79       (2)
DS$CVTREG                        000100B0   79       (2)
DS$ENDPASS                       00010010   79       (2)
DS$ENDSUB                        00010038   79       (2)    140      (9)      157      (10)     175      (11)
DS$ERRDEV                        000100C8   79       (2)
DS$ERRHARD                       000100D0   79       (2)
DS$ERRPREP                       00010108   79       (2)
```

```
                                                                          B  9
ZZ-ENKAX-1.3    Cross reference                                      30-JUN-1983        Fiche 2  Frame B9          Sequence 311
ENKAXE                         VAX-11/730 Specific CPU Cluster Exercise 30-JUN-1983 15:49:41  VAX-11 Macro V03-00          Page  16
Cross reference                                                       1-APR-1983 15:16:53  WRKD$0:[PAN.ENKAX]ENKAXE.MAR;71  (11)

DS$ERRSOFT                        000100D8     79      (2)
DS$ERRSYS                         000100C0     79      (2)
DS$ESCAPE                         00010050     79      (2)
DS$FREEDBGSYM                     000101B8     79      (2)
DS$GETBUF                         00010120     79      (2)
DS$GETMEM                         00010130     79      (2)
DS$GPHARD                         00010018     79      (2)
DS$HELP                           000101B0     79      (2)
DS$INITSCB                        00010170     79      (2)
DS$INLOOP                         00010048     79      (2)
DS$K_ERROR                       =00000002     75      (2)
DS$K_NORMAL                      =00000001     75      (2)
DS$K_SEVERE                      =00000004     75      (2)
DS$K_SUBSYS                      =00000066     75      (2)        75      (2)
DS$K_WARNING                     =00000000     75      (2)
DS$LOAD                           00010198     79      (2)
DS$LOADPCS                        000101C0     79      (2)
DS$MAPDBGBLOCK                    00010118     79      (2)
DS$MMOFF                          00010158     79      (2)
DS$MMON                           00010150     79      (2)
DS$MOVPHY                         00010148     79      (2)
DS$MOVVRT                         00010140     79      (2)
DS$PARSE                          000100B8     79      (2)
DS$PRINTB                         000100E0     79      (2)
DS$PRINTF                         000100F0     79      (2)
DS$PRINTS                         000100F8     79      (2)
DS$PRINTSIG                       00010100     79      (2)
DS$PRINTX                         000100E8     79      (2)
DS$PROBE                          000101A0     79      (2)
DS$RELBUF                         00010128     79      (2)
DS$RELMEM                         00010138     79      (2)
DS$SETIPL                         00010178     79      (2)
DS$SETMAP                         00010188     79      (2)
DS$SETPRIEXV                      00010110     79      (2)
DS$SETVEC                         00010160     79      (2)
DS$SHOCHAN                        00010190     79      (2)
DS$SUMMARY                        00010028     79      (2)
DS$WAITMS                         00010060     79      (2)
DS$WAITUS                         00010068     79      (2)
DS$_ARITH                        =006600D0     75      (2)
DS$_BADLINK                      =006600F0     75      (2)
DS$_BADTYPE                      =006600E8     75      (2)
DS$_CHME                         =006600A8     75      (2)
DS$_CHMK                         =006600E0     75      (2)
DS$_DEVNAME                      =00660108     75      (2)
DS$_ERROR                        =00660002     75      (2)
DS$_FHWE                         =00660068     75      (2)
DS$_FRAGBUF                      =00660080     75      (2)
DS$_ICBUSY                       =006600C8     75      (2)
DS$_ICERR                        =006600C0     75      (2)
DS$_IHWE                         =00660060     75      (2)
DS$_ILLCHAR                      =00660018     75      (2)
DS$_ILLPAGCNT                    =00660078     75      (2)
DS$_ILLUNIT                      =00660100     75      (2)
DS$_INSFMEM                      =00660050     75      (2)
DS$_IPL2HI                       =006600B8     75      (2)
DS$_IVADDR                       =00660040     75      (2)
```

```
                                                              C  9
ZZ-ENKAX-1.3    Cross reference                            30-JUN-1983        Fiche 2  Frame C9          Sequence 312
ENKAXE                          VAX-11/730 Specific CPU Cluster Exercise 30-JUN-1983 15:49:41  VAX-11 Macro V03-00          Page  17
Cross reference                                                           1-APR-1983 15:16:53  WRKD$0:[PAN.ENKAX]ENKAXE.MAR;71  (11)

DS$_IVVECT                  =00660038      75      (2)
DS$_KRNLSTK                 =00660090      75      (2)
DS$_LOGIC                   =00660070      75      (2)
DS$_MCHK                    =00660088      75      (2)
DS$_MMOFF                   =00660058      75      (2)
DS$_NEEDUNIT                =006600F8      75      (2)
DS$_NOPCS                   =00660110      75      (2)
DS$_NORMAL                  =00660001      75      (2)
DS$_NOSUPPORT               =006600B1      75      (2)
DS$_NOTDON                  =00660030      75      (2)
DS$_NOTIMP                  =006600B0      75      (2)        75      (2)
DS$_NULLSTR                 =00660010      75      (2)
DS$_OVERFLOW                =00660008      75      (2)
DS$_POWER                   =00660098      75      (2)
DS$_PROGERR                 =00660020      75      (2)
DS$_SEVERE                  =00660004      75      (2)
DS$_TRANSL                  =006600A0      75      (2)
DS$_TRUNCATE                =00660028      75      (2)
DS$_UNEXPINT                =006600D8      75      (2)
DS$_VASFULL                 =00660048      75      (2)
DS$_WARNING                 =00660000      75      (2)        75      (2)
DSA$AL_APTMAIL               0000FE00      74      (2)
DSA$AT_APTTXT                0000FA00      74      (2)
DSA$GL_APTCOM                0000FE04      74      (2)
DSA$GL_DEVLEN                0000FE58      74      (2)
DSA$GL_ERRNO                 0000FE44      74      (2)
DSA$GL_EVENT                 0000FE48      74      (2)
DSA$GL_FLAGS                 0000FE00      74      (2)
DSA$GL_MSGTYP                0000FE40      74      (2)
DSA$GL_PASSES                0000FE08      74      (2)
DSA$GL_PASSNO                0000FE54      74      (2)
DSA$GL_SECTNO                0000FE10      74      (2)
DSA$GL_SID                   0000FE14      74      (2)
DSA$GL_SUBTNO                0000FE4C      74      (2)
DSA$GL_TESTNO                0000FE50      74      (2)
DSA$GL_UNITS                 0000FE0C      74      (2)
DSA$GQ_MSGPTR                0000FE68      74      (2)
DSA$GT_DEVNAM                0000FE5C      74      (2)
DSA$M_APT                   =80000000      74      (2)
DSA$M_BELL                  =00000008      74      (2)
DSA$M_BINARY                =00000002      74      (2)
DSA$M_CRD_AUTOTEST          =00000800      74      (2)
DSA$M_CRD_MENUTEST          =00010000      74      (2)
DSA$M_CRD_TRACE             =00020000      74      (2)
DSA$M_DEBUG                 =04000000      74      (2)
DSA$M_HALT                  =00000001      74      (2)
DSA$M_IE1                   =00000010      74      (2)
DSA$M_IE2                   =00000020      74      (2)
DSA$M_IE3                   =00000040      74      (2)
DSA$M_IES                   =00000080      74      (2)
DSA$M_LOAD_DEBUGGER         =40000000      74      (2)
DSA$M_LOOP                  =00000004      74      (2)
DSA$M_NORPT                 =08000000      74      (2)
DSA$M_OPER                  =00001000      74      (2)
DSA$M_PASSO                 =20000000      74      (2)
DSA$M_PROMPT                =00002000      74      (2)
DSA$M_QA                    =00008000      74      (2)
```

```
ZZ-
ENK
1-3

64
63
6C
6D

72
6E
20
2E

72
75
21

64
69
70

20
72
20
21

6F
20
3D

2F

69
75
74
```

```
                                                                                 D  9
ZZ-ENKAX-1.3     Cross reference                                              30-JUN-1983            Fiche 2  Frame D9             Sequence 313
ENKAXE                              VAX-11/730 Specific CPU Cluster Exercise 30-JUN-1983 15:49:41   VAX-11 Macro V03-00              Page  18
Cross reference                                                                1-APR-1983 15:16:53  WRKD$0:[PAN.ENKAX]ENKAXE.MAR;71   (11)

DSA$M_QUICK                      =00000100      74       (2)
DSA$M_SEARCH                     =00004000      74       (2)
DSA$M_TRACE                      =00000400      74       (2)
DSA$M_USER                       =10000000      74       (2)
DSA$M_VERIFY                     =00000200      74       (2)
DSA$V_APT                        =0000001F      74       (2)
DSA$V_BELL                       =00000003      74       (2)
DSA$V_BINARY                     =00000001      74       (2)
DSA$V_CRD_AUTOTEST               =0000000B      74       (2)
DSA$V_CRD_MENUTEST               =00000010      74       (2)
DSA$V_CRD_TRACE                  =00000011      74       (2)
DSA$V_DEBUG                      =0000001A      74       (2)
DSA$V_HALT                       =00000000      74       (2)
DSA$V_IE1                        =00000004      74       (2)
DSA$V_IE2                        =00000005      74       (2)
DSA$V_IE3                        =00000006      74       (2)
DSA$V_IES                        =00000007      74       (2)
DSA$V_LOAD_DEBUGGER              =0000001E      74       (2)
DSA$V_LOOP                       =00000002      74       (2)
DSA$V_NORPT                      =0000001B      74       (2)
DSA$V_OPER                       =0000000C      74       (2)
DSA$V_PASSO                      =0000001D      74       (2)
DSA$V_PROMPT                     =0000000D      74       (2)
DSA$V_QA                         =0000000F      74       (2)
DSA$V_QUICK                      =00000008      74       (2)
DSA$V_SEARCH                     =0000000E      74       (2)
DSA$V_TRACE                      =0000000A      74       (2)
DSA$V_USER                       =0000001C      74       (2)
DSA$V_VERIFY                     =00000009      74       (2)
ENV$M_DOMAIN                     =00000002      61       (2)
ENV$M_LEVEL                      =00000001      61       (2)
ENV$M_SUPER                      =000003FC      61       (2)
ENV$S_DOMAIN                     =00000001      61       (2)
ENV$S_LEVEL                      =00000001      61       (2)
ENV$S_SUPER                      =00000008      61       (2)
ENV$V_DOMAIN                     =00000001      61       (2)       61       (2)
ENV$V_LEVEL                      =00000000      61       (2)       61       (2)
ENV$V_SUPER                      =00000002      61       (2)
ENV$_CPU                         =00000000      61       (2)       61       (2)
ENV$_FUNCTIONAL                  =00000000      61       (2)       61       (2)
ENV$_REPAIR                      =00000001      61       (2)       61       (2)
ENV$_SUPER                       =00000001      61       (2)
ENV$_SYSTEM                      =00000001      61       (2)       61       (2)
ERR$_MSGADR                      =0000000C      78       (2)
ERR$_NARGS                       =0000000A      78       (2)
ERR$_NUM                         =00000004      78       (2)
ERR$_P1                          =00000014      78       (2)
ERR$_P2                          =00000018      78       (2)
ERR$_P3                          =0000001C      78       (2)
ERR$_P4                          =00000020      78       (2)
ERR$_P5                          =00000024      78       (2)
ERR$_P6                          =00000028      78       (2)
ERR$_POINTER                     =00000010      78       (2)
ERR$_UNIT                        =00000008      78       (2)
HALT                             =00000004      82       (2)
HP$A_DEPENDENT                    00000032      80       (2)       81       (2)
HP$A_DEVICE                       00000018      80       (2)
```

```
                                                                    E  9
ZZ-ENKAX-1.3    Cross reference                                 30-JUN-1983          Fiche 2  Frame E9          Sequence 314
ENKAXE                          VAX-11/730 Specific CPU Cluster Exercise 30-JUN-1983 15:49:41  VAX-11 Macro V03-00          Page  19
Cross reference                                                           1-APR-1983 15:16:53  WRKD$0:[PAN.ENKAX]ENKAXE.MAR;71  (11)

HP$A_DVA                         0000001C     80       (2)
HP$A_LINK                        00000020     80       (2)
HP$B_DRIVE                       0000000B     80       (2)
HP$B_FLAGS                       0000000A     80       (2)
HP$M_ALLOC                      =00000001     80       (2)
HP$M_WASALL                     =00000002     80       (2)
HP$Q_DEVICE                      00000000     80       (2)
HP$T_DEVICE                      0000000C     80       (2)
HP$T_TYPE                        00000026     80       (2)
HP$V_ALLOC                      =00000000     80       (2)
HP$V_WASALL                     =00000001     80       (2)
HP$W_SIZE                        00000008     80       (2)
HP$W_VECTOR                      00000024     80       (2)
IPR                             =00000006     82       (2)
KA$B_ACC_TYPE                    00000042     81       (2)
KA$B_RESERVED                    00000043     81       (2)
KA$B_SID_TYPE                    0000003D     81       (2)
KA$K_LEN                         00000046     81       (2)
KA$L_FLAGS                       00000032     81       (2)
KA$L_SID                         0000003A     81       (2)
KA$M_CHAR                       =00000100     81       (2)
KA$M_CRC                        =00000010     81       (2)
KA$M_D_FLOAT                    =00000002     81       (2)
KA$M_EDIT                       =00000080     81       (2)
KA$M_F_FLOAT                    =00000001     81       (2)
KA$M_G_FLOAT                    =00000004     81       (2)
KA$M_H_FLOAT                    =00000008     81       (2)
KA$M_PACKED                     =00000020     81       (2)
KA$M_PACK_MUL                   =00000040     81       (2)
KA$M_SB_ERR                     =02000000     81       (2)
KA$M_TODR                       =00010000     81       (2)
KA$M_WCS_LD                     =01000000     81       (2)
KA$V_CHAR                       =00000008     81       (2)
KA$V_CRC                        =00000004     81       (2)
KA$V_D_FLOAT                    =00000001     81       (2)
KA$V_EDIT                       =00000007     81       (2)
KA$V_F_FLOAT                    =00000000     81       (2)
KA$V_G_FLOAT                    =00000002     81       (2)
KA$V_H_FLOAT                    =00000003     81       (2)
KA$V_PACKED                     =00000005     81       (2)
KA$V_PACK_MUL                   =00000006     81       (2)
KA$V_SB_ERR                     =00000019     81       (2)
KA$V_TODR                       =00000010     81       (2)
KA$V_WCS_LD                     =00000018     81       (2)
KA$W_LATENCY                     0000003E     81       (2)
KA$W_MEM_SIZE                    00000044     81       (2)
KA$W_PROGRESS                    00000040     81       (2)
KA$W_RESERVED                    00000038     81       (2)
KA$W_WCS                         00000036     81       (2)
LDPCTX                          =0000000B     82       (2)
MANUAL                          =00000001     82       (2)
MCHK                            =00000005     82       (2)
MEM                             =00000009     82       (2)
MSG_005                          00000002-R   112      (8)        120     (8)
PAR$M_ATDEF                     =00000010     76       (2)
PAR$M_ATHI                      =00000008     76       (2)
PAR$M_ATLO                      =00000004     76       (2)
```

```
PAR$M_NODEF                     =00000002      76      (2)
PAR$V_ATDEF                     =00000004      76      (2)
PAR$V_ATHI                      =00000003      76      (2)
PAR$V_ATLO                      =00000002      76      (2)
PAR$V_NODEF                     =00000001      76      (2)
PAR$_BIN                        =00000002      76      (2)
PAR$_DEC                        =0000000A      76      (2)
PAR$_HEX                        =00000010      76      (2)
PAR$_NO                         =00000000      76      (2)
PAR$_OCT                        =00000008      76      (2)
PAR$_YES                        =00000001      76      (2)
POWER                           =00000003      82      (2)
PSL$C_EXEC                      =00000001      77      (2)
PSL$C_KERNEL                    =00000000      77      (2)
PSL$C_SUPER                     =00000002      77      (2)
PSL$C_USER                      =00000003      77      (2)
PSL$K_EXEC                      =00000001      77      (2)
PSL$K_KERNEL                    =00000000      77      (2)
PSL$K_SUPER                     =00000002      77      (2)
PSL$K_USER                      =00000003      77      (2)
PSL$M_C                         =00000001      77      (2)
PSL$M_CBIT                      =00000001      77      (2)
PSL$M_CM                        =80000000      77      (2)       77      (2)
PSL$M_CURMOD                    =03000000      77      (2)
PSL$M_DV                        =00000080      77      (2)
PSL$M_FPD                       =08000000      77      (2)       77      (2)
PSL$M_FU                        =00000040      77      (2)
PSL$M_IPL                       =001F0000      77      (2)
PSL$M_IS                        =04000000      77      (2)
PSL$M_IV                        =00000020      77      (2)
PSL$M_N                         =00000008      77      (2)
PSL$M_NBIT                      =00000008      77      (2)
PSL$M_PRVMOD                    =00C00000      77      (2)
PSL$M_SAFBITS                   =000037FF      77      (2)
PSL$M_TBIT                      =00000010      77      (2)
PSL$M_TP                        =40000000      77      (2)       77      (2)
PSL$M_V                         =00000002      77      (2)
PSL$M_VBIT                      =00000002      77      (2)
PSL$M_Z                         =00000004      77      (2)
PSL$M_ZBIT                      =00000004      77      (2)
PSL$S_CURMOD                    =00000002      77      (2)
PSL$S_IPL                       =00000005      77      (2)
PSL$S_PRVMOD                    =00000002      77      (2)
PSL$V_C                         =00000000      77      (2)
PSL$V_CBIT                      =00000000      77      (2)
PSL$V_CM                        =0000001F      77      (2)
PSL$V_CURMOD                    =00000018      77      (2)
PSL$V_DV                        =00000007      77      (2)
PSL$V_FPD                       =0000001B      77      (2)
PSL$V_FU                        =00000006      77      (2)
PSL$V_IPL                       =00000010      77      (2)
PSL$V_IS                        =0000001A      77      (2)
PSL$V_IV                        =00000005      77      (2)
PSL$V_N                         =00000003      77      (2)
PSL$V_NBIT                      =00000003      77      (2)
PSL$V_PRVMOD                    =00000016      77      (2)
PSL$V_TBIT                      =00000004      77      (2)
```

```
PSL$V_TP                        =0000001E      77      (2)
PSL$V_V                         =00000001      77      (2)
PSL$V_VBIT                      =00000001      77      (2)
PSL$V_Z                         =00000002      77      (2)
PSL$V_ZBIT                      =00000002      77      (2)
SCB$L_ACCESS                     00000020      73      (2)
SCB$L_ARITH                      00000034      73      (2)
SCB$L_BREAK                      0000002C      73      (2)
SCB$L_CHME                       00000044      73      (2)
SCB$L_CHMK                       00000040      73      (2)
SCB$L_CHMS                       00000048      73      (2)
SCB$L_CHMU                       0000004C      73      (2)
SCB$L_COMPAT                     00000030      73      (2)
SCB$L_KNLSTK                     00000008      73      (2)
SCB$L_MACHCHK                    00000004      73      (2)
SCB$L_OPCCUS                     00000014      73      (2)
SCB$L_OPCDEC                     00000010      73      (2)
SCB$L_POWER                      0000000C      73      (2)
SCB$L_RADRMOD                    0000001C      73      (2)
SCB$L_ROPRAND                    00000018      73      (2)
SCB$L_RXDB                       000000F8      73      (2)
SCB$L_SFTLVL1                    00000084      73      (2)
SCB$L_SFTLVL10                   000000A8      73      (2)
SCB$L_SFTLVL11                   000000AC      73      (2)
SCB$L_SFTLVL12                   000000B0      73      (2)
SCB$L_SFTLVL13                   000000B4      73      (2)
SCB$L_SFTLVL14                   000000B8      73      (2)
SCB$L_SFTLVL15                   000000BC      73      (2)
SCB$L_SFTLVL2                    00000088      73      (2)
SCB$L_SFTLVL3                    0000008C      73      (2)
SCB$L_SFTLVL4                    00000090      73      (2)
SCB$L_SFTLVL5                    00000094      73      (2)
SCB$L_SFTLVL6                    00000098      73      (2)
SCB$L_SFTLVL7                    0000009C      73      (2)
SCB$L_SFTLVL8                    000000A0      73      (2)
SCB$L_SFTLVL9                    000000A4      73      (2)
SCB$L_TBIT                       00000028      73      (2)
SCB$L_TIMER                      000000C0      73      (2)
SCB$L_TRANSL                     00000024      73      (2)
SCB$L_TXDB                       000000FC      73      (2)
SCB$L_ZERO                       00000000      73      (2)
SEP_FUNCTIONAL                  =00000002      61      (2)
SEP_REPAIR                      =00000003      61      (2)
SIZ...                          =00000001      81      (2)      61      (2)      74      (2)      76      (2)      77      (2)
                                                                 80      (2)      81      (2)
SYS$ALLOC                        00010238      79      (2)
SYS$ASCTIM                       00010248      79      (2)
SYS$ASSIGN                       00010250      79      (2)
SYS$BINTIM                       00010258      79      (2)
SYS$CANCEL                       00010260      79      (2)
SYS$CANTIM                       00010268      79      (2)
SYS$CLOSE                        000105B8      79      (2)
SYS$CLREF                        00010298      79      (2)
SYS$CONNECT                      000105C0      79      (2)
SYS$DALLOC                       000102D8      79      (2)
SYS$DASSGN                       000102E0      79      (2)
SYS$DISCONNECT                   000105D0      79      (2)
```

```
SYS$FAO                         00010350     79      (2)
SYS$FAOL                        00010358     79      (2)
SYS$GET                         00010580     79      (2)
SYS$GETCHN                      000104C8     79      (2)
SYS$GETTIM                      00010378     79      (2)
SYS$LKWSET                      000103A0     79      (2)
SYS$NUMTIM                      000103B8     79      (2)
SYS$OPEN                        00010608     79      (2)
SYS$QIO                         000103C8     79      (2)
SYS$QIOW                        00010200     79      (2)
SYS$READ                        00010590     79      (2)
SYS$READEF                      000103D0     79      (2)
SYS$SETAST                      000103F8     79      (2)
SYS$SETEF                       00010400     79      (2)
SYS$SETIMR                      00010420     79      (2)
SYS$SETPRI                      00010428     79      (2)
SYS$SETPRT                      00010430     79      (2)
SYS$SETRWM                      00010438     79      (2)
SYS$SETSWM                      00010448     79      (2)
SYS$ULKPAG                      00010460     79      (2)
SYS$ULWSET                      00010468     79      (2)
SYS$UNWIND                      00010470     79      (2)
SYS$WAITFR                      00010478     79      (2)
SYS$WFLAND                      00010488     79      (2)
SYS$WFLOR                       00010490     79      (2)
T5_S1                           0000002E-R   138     (9)
T5_S1_X                         00000039-R   140     (9)
T5_S2                           00000044-R   155     (10)
T5_S2_X                         0000004F-R   157     (10)
T5_S3                           0000005A-R   173     (11)
T5_S3_X                         00000065-R   175     (11)
TEST_005                        0000002C-R   120     (8)       120     (8)
TEST_005_X                      00000073-R   177     (11)
TU58                           =00000002     82      (2)
UBI                            =0000000A     82      (2)
WCS                            =00000007     82      (2)       120     (8)
```

```
                                                                  I 9
ZZ-ENKAX-1.3     Cross reference                           30-JUN-1983          Fiche 2  Frame I9             Sequence 318
ENKAXE                           VAX-11/730 Specific CPU Cluster Exercise 30-JUN-1983 15:49:41   VAX-11 Macro V03-00          Page  23
Cross reference                                                            1-APR-1983 15:16:53   WRKD$0:[PAN.ENKAX]ENKAXE.MAR;71  (11)


                                          +-------------------------+
                                          ! Macros Cross Reference !
                                          +-------------------------+
MACRO              SIZE           DEFINITION        REFERENCES...
-----              ----           ----------        -------------
$D1_BSUBT          1              138     (9)       138     (9)       155     (10)      173     (11)
$D1_BTEST          1              120     (8)       120     (8)
$D1_ESUBT          1              140     (9)       140     (9)       157     (10)      175     (11)
$D1_ETEST          1              177     (11)      177     (11)
$D1_SBTTL          2              112     (8)       112     (8)       124     (9)       144     (10)      161     (11)
$D2_BDATA          1              120     (8)       120     (8)
$D2_BTEST          1              120     (8)       120     (8)
$D2_SBTTL          1              112     (8)       112     (8)
$DEF               1              81      (2)       73      (2)       74      (2)       79      (2)       80      (2)       81      (2)
$DEFEND            1              73      (2)       73      (2)       74      (2)       77      (2)       79      (2)       80      (2)
                                                    81      (2)

$DEFINI            1              73      (2)       73      (2)       74      (2)       77      (2)       79      (2)       80      (2)
                                                    81      (2)

$DS_BGNMOD         1              61      (2)       61      (2)
$DS_BGNSUB         1              138     (9)       138     (9)       155     (10)      173     (11)
$DS_BGNTEST        1              120     (8)       120     (8)
$DS_BREAK          1              177     (11)      177     (11)
$DS_DSADEF         1              74      (2)       74      (2)
$DS_DSBDEF         1              74      (2)
$DS_DSDEF          2              75      (2)       75      (2)
$DS_DSSDEF         1              79      (2)       79      (2)
$DS_ENDDATA        1              120     (8)       120     (8)
$DS_ENDMOD         1              179     (11)      179     (11)
$DS_ENDSUB         1              140     (9)       140     (9)       157     (10)      175     (11)
$DS_ENDTEST        1              177     (11)      177     (11)
$DS_ENVDEF         2              61      (2)       61      (2)
$DS_ERRDEF         1              78      (2)       78      (2)
$DS_HPODEF         2              80      (2)       80      (2)
$DS_KA_DEF         3              81      (2)       81      (2)
$DS_PAGE           1              110     (7)       110     (7)       122     (8)       142     (9)       159     (10)
$DS_PARDEF         1              76      (2)       76      (2)
$DS_PSLDEF         1              77      (2)       77      (2)
$DS_SBTTL          1              112     (8)       112     (8)       124     (9)       144     (10)      161     (11)
$DS_SCBDEF         1              73      (2)       73      (2)
$DS_SECDEF         1              82      (2)       82      (2)
$EQU               1              81      (2)       61      (2)       75      (2)       76      (2)       77      (2)
$EQULS1            1              77      (2)       61      (2)       75      (2)       77      (2)
$EQULST            1              61      (2)       61      (2)       75      (2)       77      (2)
$GBLINI            2              61      (2)       61      (2)       73      (2)       74      (2)       75      (2)       76      (2)
                                                    77      (2)       79      (2)       80      (2)       81      (2)

$HP_DEFDEF         1              80      (2)
$KADEF             1              81      (2)
$OFFDEF            1              78      (2)       78      (2)
$PSLDEF            1              77      (2)       77      (2)
$VIELD             1              61      (2)       61      (2)       74      (2)       76      (2)       77      (2)       80      (2)
                                                    81      (2)

$VIELD1            1              81      (2)       61      (2)       74      (2)       76      (2)       77      (2)       80      (2)
                                                    81      (2)

ENKAX_SECDEF       1              82      (2)       82      (2)
```

```
                                                  +-------------------------+
                                                  ! Performance indicators !
                                                  +-------------------------+
Phase                        Page faults    CPU Time       Elapsed Time
-----                        -----------    --------       ------------
Initialization                        24    00:00:00.04    00:00:00.23
Command processing                    16    00:00:00.18    00:00:00.59
Pass 1                               688    00:00:10.86    00:00:16.16
Symbol table sort                      2    00:00:00.55    00:00:00.57
Pass 2                               116    00:00:01.40    00:00:01.66
Symbol table output                   56    00:00:00.32    00:00:00.36
Psect synopsis output                  5    00:00:00.04    00:00:00.06
Cross-reference output               150    00:00:01.61    00:00:02.50
Assembler run totals                1063    00:00:15.02    00:00:22.17

The working set limit was 900 pages.
63383 bytes (124 pages) of virtual memory were used to buffer the intermediate code.
There were 20 pages of symbol table space allocated to hold 421 non-local and 0 local symbols.
180 source lines were read in Pass 1, producing 22 object records in Pass 2.
106 pages of virtual memory were used to define 37 macros.

                                                 +--------------------------+
                                                 ! Macro library statistics !
                                                 +--------------------------+
Macro library name                               Macros defined
------------------                               --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                               1
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                            29
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                            7
TOTALS (all libraries)                                      37

734 GETS were required to define 37 macros.

There were no errors, warnings or information messages.

/LIS/CRO ENKAXE
```

Table of contents

```
    (1)        1        ENKAXF: MACHINE CHECK EXCEPTIONS
    (2)       53        DECLARATIONS
    (3)      143        ERROR MESSAGES
    (4)      231        DATA TABLES
    (7)      286        ERROR REPORTING ROUTINE
    (8)      346        SUBROUTINES
    (9)      467        TEST 5:  Machine Check Exceptions
    (10)     488        SUBTEST 5.1:  Reference to NXM
    (11)     564        SUBTEST 5.2:  Unaligned reference to I/O
    (12)     639        SUBTEST 5.3:  Illegal I/O space address
    (13)     714        SUBTEST 5.4:  Illegal UNIBUS reference
```

```
0000          .SBTTL  ENKAXF: MACHINE CHECK EXCEPTIONS
0000          .TITLE  ENKAXF  VAX-11/730 Specific CPU Cluster Exerciser
0000          .IDENT  /1-3/
0000
0000    ;
0000    ; Copyright (C) 1981
0000    ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000    ;
0000    ; This software is furnished  under a license for use only on a single
0000    ; computer  system and  may be  copied only with  the inclusion of the
0000    ; above copyright notice.  This software, or any other copies thereof,
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0000    ; terms.  Title to and  ownership of the  software  shall at all times
0000    ; remain in DEC.
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0000    ; The information in this software is subject to change without notice
0000    ; and should  not be construed  as a commitment  by Digital  Equipment
0000    ; Corporation.
0000    ;
0000    ; DEC assumes  no  responsibility  for  the use or  reliability of its
0000    ; software on equipment which is not supplied by DEC.
0000    ;
0000
0000    ;++
0000    ; Facility:     VAX Architecture Diagnostic.
0000    ;
0000    ; Abstract:     This module tests some of the possible ways in which a machine
0000    ;               check exception may occure.
0000    ;
0000    ; Environment:  VAX Diagnostic Supervisor.
0000    ;
0000    ; Author:       Rich Lewis      7-Jly-81        Version 1.0
0000    ;
0000    ;               Tai-Chun Pan    01-Apr-83       Version 1.2
0000    ;
0000    ;               Added quick flag on Test 7(TU58). If quick flag is set
0000    ;               will skip subtest 4 through subtest 11.  Added event flag 3.
0000    ;               If event flag 3 is set, will override protection,
0000    ;               i.e., go ahead and write on tape.  If run APT & event flag 3
0000    ;               is clear & tape is not scratch, will report an error.
0000    ;               Modified Unibus sizer on Test 8 & 9. make test run faster.
0000    ;
0000    ;
0000    ;
0000    ;               Tai-Chun Pan    03-Aug-83       Version 1.3
0000    ;
0000    ;               fixed bugs on TEST 7 and error summary routine call when
0000    ;               running under APT.
0000    ;
0000    ;--
```

```
                  0000     53          .SBTTL  DECLARATIONS
                  0000     54          .LIST   MEB
                  0000     55          .NLIST  CND
              00000000     56          .PSECT  ENKAXF, PAGE, NOWRT
                  0000     57          .LIBRARY        "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                  0000     58          $DS_BGNMOD      CEP_REPAIR, TN=5
                  0000        ;;;      Macro-32 Diagnostic macro library Version 6.10 'DIAG.MLB (137)'
                  0000     59
                  0000     60 ;
                  0000     61 ; Include files:
                  0000     62 ;
                  0000     63
                  0000     64          .LIBRARY        "ENKAX"         ; CPU Cluster Exerciser library.
                  0000     65
                  0000     66
                  0000     70
                  0000     71          $DS_SCBDEF
                  0000     72          $DS_DSDEF
                  0000     73          $DS_DSADEF
                  0000     74          $DS_DSSDEF
                  0000     75          $DS_ERRDEF
                  0000     76          $DS_PARDEF
                  0000     77          $DS_PSLDEF
                  0000     78          $DS_HPODEF
                  0000     79          $DS_KA_DEF
                  0000     80          ENKAX_SECDEF
                  0000     81
                  0000     82 ;
                  0000     83 ; Own storage:
                  0000     84 ;
                  0000     85
                  0000     86
      00000004    0000     87 L_COUNT:          .BLKL                          ; used as a counter
      00000008    0004     88 L_ADDRESS:        .BLKL                          ; used to temporary store addresses
      0000000C    0008     89 L_CUR_ISP:        .BLKL                          ; used to store initial ISP
      00000010    000C     90 RENTRY_POINT:     .BLKL                          ; used to store rentry address
      00000014    0010     91 L_EXP_MOD:        .BLKL                          ; temp storage of expected mode
      00000018    0014     92 L_EXP_STACK:      .BLKL                          ; temp storage of expected stack
      0000001C    0018     93                   .BLKL
      00000020    001C     94 L_TIMER:          .BLKL                          ; used as a timer for interrupts
                  0020     95
      00000024    0020     96 L_FLAGS:          .BLKL                          ; contains the following flags
                  0024     97                                                ; bit positions and masks
      00000000    0024     98 V_READY=0                                      ; ready to execute flag
      00000001    0024     99 M_READY=1@0                                    ;
      00000001    0024    100 V_DONE=1                                       ; restart done flag
      00000002    0024    101 M_DONE=1@1                                     ;
      00000002    0024    102 V_EXECUTE_ERP=2                                ; execution error flag
      00000004    0024    103 M_EXECUTE_ERR=1@2                              ;
      00000003    0024    104 V_TIMER=3                                      ; timer interrupt flag
      00000008    0024    105 M_TIMER=1@3                                    ;
      00000004    0024    106 V_FATAL_ERR=4                                  ; flag fatal error
      00000010    0024    107 M_FATAL_ERR=1@4                                ;
      00000005    0024    108 V_PSL_ERR=5                                    ; flag PSL error
      00000020    0024    109 M_PSL_ERR=1@5                                  ;
      00000006    0024    110 V_GPR_ERR=6                                    ; flag GPR error
      00000040    0024    111 M_GPR_ERR=1@6                                  ;
```

```
00000007  0024     112 V_ERROR_FLAG=7                                       ; flag any error
00000080  0024     113 M_ERROR_FLAG=1@7                                     ;
00000009  0024     114 V_ISP_ERR=9                                          ; flag ISP error
00000200  0024     115 M_ISP_ERR=1@9                                        ;
0000000A  0024     116 V_SP_ERR=10                                          ; flag SP error
00000400  0024     117 M_SP_ERR=1@10                                        ;
0000000C  0024     118 V_MC_ERR=12                                          ; flag machine check error
00001000  0024     119 M_MC_ERR=1@12                                        ;
0000000D  0024     120 V_INT=13                                             ; flag interrupt
00002000  0024     121 M_INT=1@13                                           ;
0000000E  0024     122 V_MCINT=14                                           ; flag machine check interrupt
00004000  0024     123 M_MCINT=1@14                                         ;
          0024     124
00080000  0024     125 M_BIT19=1@19
00100000  0024     126 M_BIT20=1@20
00000080  0024     127 BUFSIZ=128                                           ; buffer size
00500200  0024     128 A_NXM=^X500200                                       ; address for nonexistent memory
00F00001  0024     129 A_UNAL_IO=^XF00001                                   ; address for unaligned I/O reference
00F2A000  0024     130 A_ILL_IO=^XF2A000                                    ; address for illegal I/O reference
00FC0000  0024     131 A_ILL_UB=^XFC0000                                    ; address for illegal UNIBUS reference
00000000  0024     132 L_DATA=0                                             ; data used to write nonexistent mem.
          0024     133
          0024     134
00F00000  0024     135 A_WCS_ADDRESS:   .LONG    ^XF00000                   ; starting address of wcs
          0028     136
          0028     137
          0028     141
```

```
                                     0028    143 .SBTTL  ERROR MESSAGES
                                     0028    144 ;----------------------------------------------------------------------
                                     0028    145 T_NO_KA730:
69 76 65 64 20 6F 4E 20 20 2F 21 00' 0028    146         .ASCIC  "!/  No devices of type KA730 selected.  Exiting test.!/"
20 65 70 79 74 20 66 6F 20 73 65 63  0034
74 63 65 6C 65 73 20 30 33 37 41 4B  0040
67 6E 69 74 69 78 45 20 20 2E 64 65  004C
            2F 21 2E 74 73 65 74 20  0058
                                 37  0028
                                     0060    147 ;----------------------------------------------------------------------
                                     0060    148 T_MC_MESS:
20 64 65 74 70 6D 65 74 74 41 20 00' 0060    149         .ASCIC  " Attempted to cause a Machine Check by!/"
4D 20 61 20 65 73 75 61 63 20 6F 74  006C
6B 63 65 68 43 20 65 6E 69 68 63 61  0078
               2F 21 79 62 20 28     0084
                                 28  0060
                                     0089    150 ;----------------------------------------------------------------------
                                     0089    151 T_BUSERR:
20 67 6E 69 73 73 65 63 63 61 20 00' 0089    152         .ASCIC  " accessing a nonexistent memory location!/!/"
6E 65 74 73 69 78 65 6E 6F 6E 20 61  0095
63 6F 6C 20 79 72 6F 6D 65 6D 20 74  00A1
      2F 21 2F 21 6E 6F 69 74 61     00AD
                                 2C  0089
                                     00B6    153 ;----------------------------------------------------------------------
                                     00B6    154 T_UNALIO_ERR:
20 67 6E 69 73 73 65 63 63 61 20 00' 00B6    155         .ASCIC  " accessing an unaligned I/O address!/!/"
64 65 6E 67 69 6C 61 6E 75 20 6E 61  00C2
73 73 65 72 64 64 61 20 4F 2F 49 20  00CE
                     2F 21 2F 21     00DA
                                 27  00B6
                                     00DE    156 ;----------------------------------------------------------------------
                                     00DE    157 T_ILLIO_ERR:
20 67 6E 69 73 73 65 63 63 61 20 00' 00DE    158         .ASCIC  " accessing an illegal I/O address!/!/"
49 20 6C 61 67 65 6C 6C 69 20 6E 61  00EA
2F 21 73 73 65 72 64 64 61 20 4F 2F  00F6
                              2F 21  0102
                                 25  00DE
                                     0104    159 ;----------------------------------------------------------------------
                                     0104    160 T_ILLUB_ERR:
20 67 6E 69 73 73 65 63 63 61 20 00' 0104    161         .ASCIC  " accessing an illegal UNIBUS address!/!/"
55 20 6C 61 67 65 6C 6C 69 20 6E 61  0110
73 65 72 64 64 61 20 53 55 42 49 4E  011C
               2F 21 2F 21 73        0128
                                 28  0104
                                     012D    162 ;----------------------------------------------------------------------
                                     012D    163 T_MC_ERR:
6D 20 6E 69 20 72 6F 72 72 45 20 00' 012D    164         .ASCIC  " Error in machine check logout stack!/"-
6B 63 65 68 63 20 65 6E 69 68 63 61  0139
63 61 74 73 20 74 75 6F 67 6F 6C 20  0145
21 3A 4C 41 55 54 43 41 20 2F 21 6B  0151
                                 2F  015D
                                 30  012D
                                     015E    165                 " ACTUAL:!/"
                                     015E    166 ;----------------------------------------------------------------------
                                     015E    167 T_EXPECTED:
21 3A 44 45 54 43 45 50 58 45 20 00' 015E    168         .ASCIC  " EXPECTED:!/"
                                 2F  016A
                                 0C  015E
                                     016B   169 ;-----------------------------------------------------------------------
                                     016B   170 T_UNEXP_DATA:
64 65 74 63 65 70 78 65 6E 55 20 00' 016B   171             .ASCIC  " Unexpected data in machine check logout information"
63 61 6D 20 6E 69 20 61 74 61 64 20  0177
6C 20 6B 63 65 68 63 20 65 6E 69 68  0183
6D 72 6F 66 6E 69 20 74 75 6F 67 6F  018F
                     6E 6F 69 74 61  019B
                                 34  016B
                                     01A0   172 ;-----------------------------------------------------------------------
                                     01A0   173 T_NOT_READY:
72 74 73 6E 69 20 74 73 65 54 20 00' 01A0   174             .ASCIC  " Test instruction was not ready to be executed.!/"
6E 20 73 61 77 20 6E 6F 69 74 63 75  01AC
20 6F 74 20 79 64 61 65 72 20 74 6F  01B8
2E 64 65 74 75 63 65 78 65 20 65 62  01C4
                              2F 21  01D0
                                 31  01A0
                                     01D2   175 ;--------------------------------------------------------------------------
                                     01D2   176 T_EXECUTE:
72 74 73 6E 69 20 74 73 65 54 20 00' 01D2   177             .ASCIC  " Test instruction execution error.!/"
75 63 65 78 65 20 6E 6F 69 74 63 75  01DE
21 2E 72 6F 72 72 65 20 6E 6F 69 74  01EA
                                 2F  01F6
                                 24  01D2
                                     01F7   178 ;--------------------------------------------------------------------------
                                     01F7   179 T_TIMER:
64 65 74 63 65 70 78 65 6E 55 20 00' 01F7   180             .ASCIC  " Unexpected interval timer interrupt.!/"
69 74 20 6C 61 76 72 65 74 6E 69 20  0203
70 75 72 72 65 74 6E 69 20 72 65 6D  020F
                        2F 21 2E 74  021B
                                 27  01F7
                                     021F   181 ;--------------------------------------------------------------------------
                                     021F   182 T_ISP_ERR:
20 74 70 75 72 72 65 74 6E 49 20 00' 021F   183             .ASCIC  " Interrupt SP is incorrect - EXP = !XL  ACT = !XL!/"
72 72 6F 63 6E 69 20 73 69 20 50 53  022B
20 3D 20 50 58 45 20 2D 20 74 63 65  0237
21 20 3D 20 54 43 41 20 20 4C 58 21  0243
                        2F 21 4C 58  024F
                                 33  021F
                                     0253   184 ;--------------------------------------------------------------------------
                                     0253   185 T_SP_ERR1:
6F 63 6E 69 20 73 69 20 50 53 20 00' 0253   186             .ASCIC  " SP is incorrect - EXP = !XL  ACT = !XL!/"
20 50 58 45 20 2D 20 74 63 65 72 72  025F
3D 20 54 43 41 20 20 4C 58 21 20 3D  026B
                  2F 21 4C 58 21 20  0277
                                 29  0253
                                     027D   187 ;--------------------------------------------------------------------------
                                     027D   188 T_SP_ERR2:
2F 21 4C 58 21 20 3D 20 50 53 20 00' 027D   189             .ASCIC  " SP = !XL!/"
                                 0B  027D
                                     0289   190 ;--------------------------------------------------------------------------
                                     0289   191 T_GPR_ERR:
69 20 61 74 61 64 20 64 61 42 20 00' 0289   192             .ASCIC  " Bad data in general purpose register:!/"
75 70 20 6C 61 72 65 6E 65 67 20 6E  0295
74 73 69 67 65 72 20 65 73 6F 70 72  02A1
                        2F 21 3A 72 65  02AD
                                 28  0289
```

```
                                      02B2    193 ;-----------------------------------------------------------------------------
                                      02B2    194 T_BAD_DATA:
58 21 20 3D 20 50 58 45 20 20 20 00'  02B2    195         .ASCIC  "   EXP = !XL     ACT = !XL     XOR= !XL !/"
21 20 3D 20 54 43 41 20 20 20 20 4C   02BE
21 20 3D 52 4F 58 20 20 20 20 4C 58   02CA
               2F 21 20 4C 58         02D6
                              28      02B2
                                      02DB    196 ;-----------------------------------------------------------------------------
                                      02DB    197 T_GOOD_DATA:
58 21 20 3D 20 50 58 45 20 20 20 00'  02DB    198         .ASCIC  "   EXP = !XL     ACT = !XL !/"
21 20 3D 20 54 43 41 20 20 20 20 4C   02E7
               2F 21 20 4C 58         02F3
                              1C      02DB
                                      02F8    199 ;-----------------------------------------------------------------------------
                                      02F8    200 T_NOT_ON_KS:
72 65 4B 20 6E 6F 20 74 6F 4E 20 00'  02F8    201         .ASCIC  " Not on Kernel Stack as expected.!/"
73 61 20 6B 63 61 74 53 20 6C 65 6E   0304
2F 21 2E 64 65 74 63 65 70 78 65 20   0310
                              23      02F8
                                      031C    202 ;-----------------------------------------------------------------------------
                                      031C    203 T_NOT_ON_IS:
74 6E 49 20 6E 6F 20 74 6F 4E 20 00'  031C    204         .ASCIC  " Not on Interrupt Stack as expected.!/"
6B 63 61 74 53 20 74 70 75 72 72 65   0328
64 65 74 63 65 70 78 65 20 73 61 20   0334
                        2F 21 2E      0340
                              26      031C
                                      0343    205 ;-----------------------------------------------------------------------------
                                      0343    206 T_EXP_PSL:
50 20 64 65 74 63 65 70 78 45 20 00'  0343    207         .ASCIC  " Expected PSL = !_!XL(X) ; !AC!/"
58 28 4C 58 21 5F 21 20 3D 20 4C 53   034F
         2F 21 43 41 21 20 3B 20 29   035B
                              20      0343
                                      0364    208 ;-----------------------------------------------------------------------------
                                      0364    209 T_ACT_PSL:
4C 53 50 20 6C 61 75 74 63 41 20 00'  0364    210         .ASCIC  " Actual PSL = !_!XL(X) ; !AC!/"
20 29 58 28 4C 58 21 5F 21 20 3D 20   0370
               2F 21 43 41 21 20 3B   037C
                              1E      0364
                                      0383    211 ;-----------------------------------------------------------------------------
                                      0383    212 T_PSL:
58 21 5F 21 20 3D 20 4C 53 50 20 00'  0383    213         .ASCIC  " PSL = !_!XL (X) ; !AC!/"
21 43 41 21 20 3B 20 29 58 28 20 4C   038F
                              2F      039B
                              18      0383
                                      039C    214 ;-----------------------------------------------------------------------------
                                      039C    215 T_GPR:
20 20 72 65 74 73 69 67 65 52 20 00'  039C    216         .ASCIC  " Register  Expected    Actual     XOR!/"
20 20 20 20 64 65 74 63 65 70 78 45   03A8
58 20 20 20 20 20 6C 61 75 74 63 41   03B4
                     2F 21 52 4F      03C0
                              27      039C
                                      03C4    217 ;-----------------------------------------------------------------------------
                                      03C4    218 T_XOR:
21 20 20 5F 21 43 41 21 20 20 20 00'  03C4    219         .ASCIC  "   !AC!_  !XL   !XL   !XL!/"
21 20 20 20 4C 58 21 20 20 20 4C 58   03D0
                     2F 21 4C 58      03DC
                              1B      03C4
```

```
                                     03E0    220 ;--------------------------------------------------------------------------------
                                     03E0    221 T_NOXOR:
21 20 20 5F 21 43 41 21 20 20 20 00' 03E0    222         .ASCIC  ''   !AC!_  !XL   !XL!/''
      2F 21 4C 58 21 20 20 20 4C 58  03EC
                                 15  03E0
                                     03F6    223 ;--------------------------------------------------------------------------------
                                     03F6    224 T_NO_WCS:
57 20 67 6E 69 74 69 78 45 2F 21 00' 03F6    225         .ASCIC  ''!/Exiting WCS parity subtest, WCS last address = 0.!/''
75 73 20 79 74 69 72 61 70 20 53 43  0402
6C 20 53 43 57 20 2C 74 73 65 74 62  040E
20 73 73 65 72 64 64 61 20 74 73 61  041A
               2F 21 2E 30 20 3D     0426
                                 35  03F6
                                     042C    226 ;--------------------------------------------------------------------------------
                                     042C    227
                                     042C    228
                                     042C    229
```

```
                    042C     231 .SBTTL  DATA TABLES
                    042C     232
                    042C     233 ; Data table for test 1
                    042C     234
          00000000  042C     235 DATA_1: .LONG   ^X0              ; expected PSL
                    0430     236
                    0430     237
          0430
          0430
          0430
          0430
00000007  0430  TABLE1: .LONG   7               ; length for printsig
00660088  0434          .LONG   DS$_MCHK        ; type of exception = machine check
0000000C  0438          .LONG   ^XC             ; count
00000008  043C          .LONG   ^X8             ; machine check type = ref. to NXM
00500200  0440          .LONG   A_NXM           ; NXM address
00000000  0444          .LONG   ^X0             ; error parameter 2
000000BB' 0448          .LONG   TAG_1           ; PC
00000000  044C          .LONG   ^X0             ; PSL
          0450
          0450
00000007  0450  TABLE2: .LONG   7               ; length for printsig
00660088  0454          .LONG   DS$_MCHK        ; type of exception = machine check
0000000C  0458          .LONG   ^XC             ; count
00000009  045C          .LONG   ^X9             ; machine check type = unaligned IO ref.
00F00001  0460          .LONG   A_UNAL_IO       ; unaligned IO address
00000000  0464          .LONG   ^X0             ; errcr parameter 2
0000019A' 0468          .LONG   TAG_2           ; PC
00000000  046C          .LONG   ^X0             ; PSL
          0470
          0470
00000007  0470  TABLE3: .LONG   7               ; length for printsig
00660088  0474          .LONG   DS$_MCHK        ; type of exception = machine check
0000000C  0478          .LONG   ^XC             ; count
0000000A  047C          .LONG   ^XA             ; machine check type = illegal IO ref.
00F2A000  0480          .LONG   A_ILL_IO        ; illegal IO address
00000000  0484          .LONG   ^X0             ; error parameter 2
00000279' 0488          .LONG   TAG_3           ; PC
00000000  048C          .LONG   ^X0             ; PSL
          0490
          0490
00000007  0490  TABLE4: .LONG   7               ; length for printsig
00660088  0494          .LONG   DS$_MCHK        ; type of exception = machine check
0000000C  0498          .LONG   ^XC             ; count
0000000B  049C          .LONG   ^XB             ; machine check type = illegal UNIBUS ref.
00FC0000  04A0          .LONG   A_ILL_UB        ; illegal unibus address
00000000  04A4          .LONG   ^X0             ; error parameter 2
00000358' 04A8          .LONG   TAG_4           ; PC
00000000  04AC          .LONG   ^X0             ; PSL
          04B0
          04B0
          04B0
          04B0
```

```
                             04B0   286 .SBTTL ERROR REPORTING ROUTINE
                             04B0   287
                             04B0   288 ERR_MESSAGE:
                             04B0   289         $DS_BGNMESSAGE  REGMASK=<R2,R7> ; Save R2 and R7
                       0084  04B0                       .WORD   ^M<R2,R7>                ; ENTRY MASK
     5E   00000084 8F    C2  04B2   290         SUBL2   #BUFSIZ+4,SP            ; Reserve room on stack for cvtreg
               52  5E    D0  04B9   291         MOVL    SP,R2                   ; Save starting address of buffer
                             04BC   292         $DS_PRINTB_S    FORMAT=T_MC_MESS
              FBA0 CF    9F  04BC                       PUSHAB  T_MC_MESS
     000100E0 9F   01    FB  04C0                       CALLS   #$$N, @#DS$PRINTB
                             04C7   293         $DS_PRINTB_S    FORMAT=@ERR$_P1(AP)
                14 BC    9F  04C7                       PUSHAB  @ERR$_P1(AP)
     000100E0 9F   01    FB  04CA                       CALLS   #$$N, @#DS$PRINTB
      32 FB4A CF   0C    E1  04D1   294         BBC     #V_MC_ERR,L_FLAGS,1$    ; br = no machine check error
                             04D7   295         $DS_PRINTB_S    FORMAT=T_MC_ERR
              FC52 CF    9F  04D7                       PUSHAB  T_MC_ERR
     000100E0 9F   01    FB  04DB                       CALLS   #$$N, @#DS$PRINTB
57   38   00000000'EF    C1  04E2   296         ADDL3   A_MCHK_BUFFER,#56,R7    ; load address of actual data
         67   FF42 CF    7D  04EA   297         MOVQ    TABLE1,(R7)             ; load size and type
                             04EF   298         $DS_PRINTSIG_G  ARGPTR=(R7)
     00010100 9F   67    FA  04EF                       CALLG   (R7), @#DS$PRINTSIG
                             04F6   299         $DS_PRINTB_S    FORMAT=T_EXPECTED
              FC64 CF    9F  04F6                       PUSHAB  T_EXPECTED
     000100E0 9F   01    FB  04FA                       CALLS   #$$N, @#DS$PRINTB
                             0501   300         $DS_PRINTSIG_G  ARGPTR=@ERR$_P2(AP)
  00010100 9F   18 BC    FA  0501                       CALLG   @ERR$_P2(AP), @#DS$PRINTSIG
      0B FB12 CF   00    E0  0509   301 1$:     BBS     #V_READY,L_FLAGS,3$     ; br = instruction ready to execute
                             050F   302         $DS_PRINTB_S    FORMAT=T_NOT_READY
              FC8D CF    9F  050F                       PUSHAB  T_NOT_READY
     000100E0 9F   01    FB  0513                       CALLS   #$$N, @#DS$PRINTB
      0B FB01 CF   02    E1  051A   303 3$:     BBC     #V_EXECUTE_ERR,L_FLAGS,4$ ; br = instruction executed
                             0520   304         $DS_PRINTB_S    FORMAT=T_EXECUTE
              FCAE CF    9F  0520                       PUSHAB  T_EXECUTE
     000100E0 9F   01    FB  0524                       CALLS   #$$N, @#DS$PRINTB
      17 FAF0 CF   09    E1  052B   305 4$:     BBC     #V_ISP_ERR,L_FLAGS,8$   ; br = no ISP error
                             0531   306         $DS_PRINTX_S    FORMAT=T_ISP_ERR,P0=L_EXP_ISP,P1=L_ACT_ISP
          00000000'EF    DD  0531                       PUSHL   L_ACT_ISP
          00000000'EF    DD  0537                       PUSHL   L_EXP_ISP
              FCDE CF    9F  053D                       PUSHAB  T_ISP_ERR
     000100E8 9F   03    FB  0541                       CALLS   #$$N, @#DS$PRINTX
      19 FAD3 CF   0A    E1  0548   307 8$:     BBC     #V_SP_ERR,L_FLAGS,9$    ; br = no SP error
                             054E   308         $DS_PRINTB_S    FORMAT=T_SP_ERR1,P0=L_EXP_SP,P1=L_ACT_SP
          00000000'EF    DD  054E                       PUSHL   L_ACT_SP
          00000000'EF    DD  0554                       PUSHL   L_EXP_SP
              FCF5 CF    9F  055A                       PUSHAB  T_SP_ERR1
     000100E0 9F   03    FB  055E                       CALLS   #$$N, @#DS$PRINTB
                   11    11  0565   309         BRB     10$                     ; skip extended error report
                             0567   310 9$:     $DS_PRINTX_S    FORMAT=T_SP_ERR2,P0=L_ACT_SP
          00000000'EF    DD  0567                       PUSHL   L_ACT_SP
              FD0C CF    9F  056D                       PUSHAB  T_SP_ERR2
     000100E8 9F   02    FB  0571                       CALLS   #$$N, @#DS$PRINTX
      03 FAA3 CF   05    E0  0578   311 10$:    BBS     #V_PSL_ERR,L_FLAGS,11$  ; br = PSL error
                 008A    31  057E   312         BRW     12$                     ; skip messages
                             0581   313 11$:    $DS_CVTREG_S    MSB=#31,DATA=L_EXP_PSL,MNEADR=A_PSLMNE,-
                             0581   314                         STRBUF=(R2),MAXLEN=#BUFSIZ,-
                             0581   315                         V1=MODELIST,V2=MODELIST
                   00    DD  0581                       PUSHL   #0
               00   DD  0583                         PUSHL   #0
               00   DD  0585                         PUSHL   #0
               00   DD  0587                         PUSHL   #0
      00000000'EF   DF  0589                         PUSHAL  MODELIST
      00000000'EF   DF  058F                         PUSHAL  MODELIST
      00000080 8F   DD  0595                         PUSHL   #BUFSIZ
               62   9F  059B                         PUSHAB  (R2)
      00000000'EF   9F  059D                         PUSHAB  A_PSLMNE
      00000000'EF   DD  05A3                         PUSHL   L_EXP_PSL
               1F   DD  05A9                         PUSHL   #31
  000100B0 9F  0B   FB  05AB                         CALLS   #11, @#DS$CVTREG
                        05B2   316          $DS_PRINTB_S     FORMAT=T_EXP_PSL,P0=L_EXP_PSL,P1=R2
               52   DD  05B2                         PUSHL   R2
      00000000'EF   DD  05B4                         PUSHL   L_EXP_PSL
          FD85 CF   9F  05BA                         PUSHAB  T_EXP_PSL
  000100E0 9F  03   FB  05BE                         CALLS   #$$N, @#DS$PRINTB
                        05C5   317          $DS_CVTREG_S     MSB=#31,DATA=L_ACT_PSL,MNEADR=A_PSLMNE,-
                        05C5   318                           STRBUF=(R2),MAXLEN=#BUFSIZ,-
                        05C5   319                           V1=MODELIST,V2=MODELIST
               00   DD  05C5                         PUSHL   #0
               00   DD  05C7                         PUSHL   #0
               00   DD  05C9                         PUSHL   #0
               00   DD  05CB                         PUSHL   #0
      00000000'EF   DF  05CD                         PUSHAL  MODELIST
      00000000'EF   DF  05D3                         PUSHAL  MODELIST
      00000080 8F   DD  05D9                         PUSHL   #BUFSIZ
               62   9F  05DF                         PUSHAB  (R2)
      00000000'EF   9F  05E1                         PUSHAB  A_PSLMNE
      00000000'EF   DD  05E7                         PUSHL   L_ACT_PSL
               1F   DD  05ED                         PUSHL   #31
  000100B0 9F  0B   FB  05EF                         CALLS   #11, @#DS$CVTREG
                        05F6   320          $DS_PRINTB_S     FORMAT=T_ACT_PSL,P0=L_ACT_PSL,P1=R2
               52   DD  05F6                         PUSHL   R2
      00000000'EF   DD  05F8                         PUSHL   L_ACT_PSL
          FD62 CF   9F  05FE                         PUSHAB  T_ACT_PSL
  000100E0 9F  03   FB  0602                         CALLS   #$$N, @#DS$PRINTB
               44   11  0609   321          BRB      13$
                        060B   322 12$:     $DS_CVTREG_S     MSB=#31,DATA=L_EXP_PSL,MNEADR=A_PSLMNE,-
                        060B   323                           STRBUF=(R2),MAXLEN=#BUFSIZ,-
                        060B   324                           V1=MODELIST,V2=MODELIST
               00   DD  060B                         PUSHL   #0
               00   DD  060D                         PUSHL   #0
               00   DD  060F                         PUSHL   #0
               00   DD  0611                         PUSHL   #0
      00000000'EF   DF  0613                         PUSHAL  MODELIST
      00000000'EF   DF  0619                         PUSHAL  MODELIST
      00000080 8F   DD  061F                         PUSHL   #BUFSIZ
               62   9F  0625                         PUSHAB  (R2)
      00000000'EF   9F  0627                         PUSHAB  A_PSLMNE
      00000000'EF   DD  062D                         PUSHL   L_EXP_PSL
               1F   DD  0633                         PUSHL   #31
  000100B0 9F  0B   FB  0635                         CALLS   #11, @#DS$CVTREG
                        063C   325          $DS_PRINTX_S     FORMAT=T_PSL,P0=L_EXP_PSL,P1=R2
               52   DD  063C                         PUSHL   R2
      00000000'EF   DD  063E                         PUSHL   L_EXP_PSL
          FD3B CF   9F  0644                         PUSHAB  T_PSL
  000100E8 9F  03   FB  0648                         CALLS   #$$N, @#DS$PRINTX
```

```
                                                                            J 10
ZZ-ENKAX-1.3     ERROR REPORTING ROUTINE                                  3-AUG-1983          Fiche 2  Frame J10          Sequence 332
ENKAXF                               VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:46:48  VAX-11 Macro V03-00          Page  12
1-3                                  ERROR REPORTING ROUTINE                   3-AUG-1983 09:59:33  WRKD$0:[PAN.ENKAX]ENKAXF.MAR;72   (7)

             5C F9CC CF    06   E1  064F    326 13$:    BBC     #V_GPR_ERR,L_FLAGS,17$ ; br = no GPR error
                                    0655    327         $DS_PRINTB_S    FORMAT=T_GPR
                  FD43 CF   9F      0655                        PUSHAB  T_GPR
            000100E0 9F    01   FB  0659                        CALLS   #$$N, @#DS$PRINTB
            53   00000000'EF    DE  0660    328         MOVAL   GPR_TABLE,R3             ; load address of expected data
            54   00000000'EF    D0  0667    329         MOVL    A_MCHK_BUFFER,R4         ; load address of actual data
                           55   7C  066E    330         CLRQ    R5                       ; init R5 and R6 for counter and data
                     57    0D   D0  0670    331         MOVL    #13,R7                   ; load limit
         58   00000000'EF45     DE  0673    332 14$:    MOVAL   REG_TABLE[R5],R8         ; load address of ascic string
            56   6445    6345   CD  067B    333         XORL3   (R3)[R5],(R4)[R5],R6     ; get XOR of data if bad
                           17   13  0681    334         BEQL    15$                      ; br = good data
                                    0683    335         $DS_PRINTB_S    FORMAT=T_XOR,P0=R8,P1=(R3)[R5],P2=(R4)[R5],P3=R6
                           56   DD  0683                        PUSHL   R6
                         6445   DD  0685                        PUSHL   (R4)[R5]
                         6345   DD  0688                        PUSHL   (R3)[R5]
                           58   DD  068B                        PUSHL   R8
                  FD33 CF   9F      068D                        PUSHAB  T_XOR
            000100E0 9F    05   FB  0691                        CALLS   #$$N, @#DS$PRINTB
                           13   11  0698    336         BRB     16$                      ; check if finished
                                    069A    337 15$:    $DS_PRINTX_S    FORMAT=T_NOXOR,P0=R8,P1=(R3)[R5],P2=(R4)[R5]
                         6445   DD  069A                        PUSHL   (R4)[R5]
                         6345   DD  069D                        PUSHL   (R3)[R5]
                           58   DD  06A0                        PUSHL   R8
                  FD3A CF   9F      06A2                        PUSHAB  T_NOXOR
            000100E8 9F    04   FB  06A6                        CALLS   #$$N, @#DS$PRINTX
                     C2 55 57   F3  06AD    338 16$:    AOBLEQ  R7,R5,14$
             0B F96A CF    03   E1  06B1    339 17$:    BBC     #V_TIMER,L_FLAGS,18$     ; br = no timer error
                                    06B7    340         $DS_PRINTB_S    FORMAT=T_TIMER
                  FB3C CF   9F      06B7                        PUSHAB  T_TIMER
            000100E0 9F    01   FB  06BB                        CALLS   #$$N, @#DS$PRINTB
                                    06C2    341 18$:    $DS_ENDMESSAGE
                                04  06C2                        RET                      ; RETURN TO DIAGNOSTIC SUPERVISOR
                                    06C3    342
                                    06C3    343
                                    06C3    344
```

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```
                                  06C3  .SBTTL  SUBROUTINES
                                  06C3
                                  06C3  ; This routine will load R0 through R11 with data patterns and read the
                                  06C3  ; AP and FP to check after causing a machine check.
                                  06C3
                                  06C3  LOAD_GPR:
          5B   00000000'EF   DE   06C3          MOVAL   GPR_TABLE,R11    ; load address of data table to load GPR's
                      50  8B 7D   06CA          MOVQ    (R11)+,R0        ; move data into R0 and R1
                      52  8B 7D   06CD          MOVQ    (R11)+,R2        ; move data into R2 and R3
                      54  8B 7D   06D0          MOVQ    (R11)+,R4        ; move data into R4 and R5
                      56  8B 7D   06D3          MOVQ    (R11)+,R6        ; move data into R6 and R7
                      58  8B 7D   06D6          MOVQ    (R11)+,R8        ; move data into R8 and R9
                      5A  8B 7D   06D9          MOVQ    (R11)+,R10       ; move data into R10 and R11
             00000000'EF  5C D0   06DC          MOVL    AP,L_EXP_AP      ; move contents of AP into expected data table
             00000000'EF  5D D0   06E3          MOVL    FP,L_EXP_FP      ; move contents of FP into expected data table
                             05   06EA          RSB                      ; return
                                  06EB
                                  06EB  ; This routine will read general purpose registers R0 to R11 , the AP, FP, SP
                                  06EB  ; KSP, ISP and PSL into a buffer area (A_MCHK_BUFFER) to check data patterns
                                  06EB  ; and data after a machine check exception. It will then retrun to to address
                                  06EB  ; contained in RENTRY_POINT.
                                  06EB
                                  06EB          .ALIGN  LONG
                                  06EC  READ_GPR:
             00000000'8F  00 DA   06EC          MTPR    #0,#PR$_MCESR    ; clear pending mach check flag
             00000000'FF  50 7D   06F3          MOVQ    R0,@A_MCHK_BUFFER ; move contents of R0 and R1 into buffer
          50   00000000'EF   D0   06FA          MOVL    A_MCHK_BUFFER,R0 ; load R0 with address of buffer
                      50  08 C0   0701          ADDL2   #8,R0            ; get over first two entries
                      80  52 7D   0704          MOVQ    R2,(R0)+         ; move contents of R2 and R3 into buffer
                      80  54 7D   0707          MOVQ    R4,(R0)+         ; move R4 and R5
                      80  56 7D   070A          MOVQ    R6,(R0)+         ; move R6 and R7
                      80  58 7D   070D          MOVQ    R8,(R0)+         ; move R8 and R9
                      80  5A 7D   0710          MOVQ    R10,(R0)+        ; move R10 and R11
                      80  5C D0   0713          MOVL    AP,(R0)+         ; move AP
                      80  5D D0   0716          MOVL    FP,(R0)+         ; move FP
             00000000'EF  5E D0   0719          MOVL    SP,L_ACT_SP      ; move SP
 00000000'EF   00000000'8F   DB   0720          MFPR    #PR$_ISP,L_ACT_ISP ; move ISP
               00000000'EF   DC   072B          MOVPSL  L_ACT_PSL        ; move PSL
                      50  08 C0   0731          ADDL2   #8,R0            ; save room for printsig size and type
                          57 D4   0734          CLRL    R7               ; init counter
                      55  05 D0   0736          MOVL    #5,R5            ; set limit
                      80  8E D0   0739  1$:     MOVL    (SP)+,(R0)+      ; move MC logout into buffer
                   F9 57  55 F3   073C          AOBLEQ  R5,R7,1$         ; br = not finished
                   F8C8 DF   17   0740          JMP     @RENTRY_POINT    ; return to subtest
                                  0744
                                  0744
                                  0744
                                  0744  ; This routire is called after execution of an instruction which should cause
                                  0744  ; a machine check. The MACHINE CHECK LOGOUT, PSL, SP, KSP, ISP, GENERAL
                                  0744  ; PURPOSE REGISTERS and FLAG BYTE are examined for expected information. If
                                  0744  ; an error exists, a flag is set to indicate that it should be reported.
                                  0744
                                  0744
                                  0744  ERROR_CHECK:
                          57 D4   0744          CLRL    R7               ; initialize counter
                      55  0D D0   0746          MOVL    #13,R5           ; set limit
          53   00000000'EF   D0   0749          MOVL    A_MCHK_BUFFER,R3 ; load address of actual data to check
```

```
              54    00000000'EF   DE  0750    403            MOVAL    GPR_TABLE,R4       ; load address of expected data
                         84  83   D1  0757    404 1$:        CMPL     (R3)+,(R4)+        ; check data
                             09   13  075A    405            BEQL     2$                 ; br = data is good
          F8BB CF   000000C0 8F   C8  075C    406            BISL2    #M_ERROR_FLAG!M_GPR_ERR,L_FLAGS ; set GPR and error flag
                      EE 57  55   F3  0765    407 2$:        AOBLEQ   R5,R7,1$           ; br = not finished
             1A F8B2 CF      0D   E0  0769    408            BBS      #V_INT,L_FLAGS,5$ ; br = checking an interrupt
                         53  08   C0  076F    409            ADDL2    #8,R3              ; get over size and type to check machine check
                             57   D4  0772    410            CLRL     R7                 ; init counter
                         55  05   D0  0774    411            MOVL     #5,R5              ; set limit
                         86  83   D1  0777    412 3$:        CMPL     (R3)+,(R6)+        ; check MC logout data
                             09   13  077A    413            BEQL     4$                 ; br = data good
          F89B CF   00001080 8F   C8  077C    414            BISL2    #M_ERROR_FLAG!M_MC_ERR,L_FLAGS ; set error flag
                      EE 57  55   F3  0785    415 4$:        AOBLEQ   R5,R7,3$           ; br = not finished
     00000000'EF    00000000'EF   D1  0789    416 5$:        CMPL     L_ACT_SP,L_EXP_SP ; check SP
                             09   13  0794    417            BEQL     7$                 ; br = SP is good
          F881 CF   00000480 8F   C8  0796    418            BISL2    #M_SP_ERR!M_ERROR_FLAG,L_FLAGS ; set SP and error flag
     00000000'EF    00000000'EF   D1  079F    419 7$:        CMPL     L_ACT_ISP,L_EXP_ISP ; check ISP
                             09   13  07AA    420            BEQL     8$                 ; br = ISP is good
          F86B CF   00000280 8F   C8  07AC    421            BISL2    #M_ISP_ERR!M_ERROR_FLAG,L_FLAGS ; set ISP and error flag
     00000000'EF    00000000'EF   D1  07B5    422 8$:        CMPL     L_ACT_PSL,L_EXP_PSL ; check PSL
                             3E   13  07C0    423            BEQL     11$                ; br = PSL is good
                     02      18   EF  07C2    424            EXTZV    #PSL$V_CURMOD,#PSL$S_CURMOD,-
          F843 CF   00000000'EF       07C5    425                     L_EXP_PSL,L_EXP_MOD ; extract current mode from expected psl
                     02      18   ED  07CD    426            CMPZV    #PSL$V_CURMOD,#PSL$S_CURMOD,-
          F838 CF   00000000'EF       07D0    427                     L_ACT_PSL,L_EXP_MOD ; check current mode for error
                             18   12  07D8    428            BNEQ     9$                 ; br = wrong mode
                     01      1A   EF  07DA    429            EXTZV    #PSL$V_IS,#1,-
          F82F CF   00000000'EF       07DD    430                     L_EXP_PSL,L_EXP_STACK ; extract stack from expected PSL
                     01      1A   ED  07E5    431            CMPZV    #PSL$V_IS,#1,-
          F824 CF   00000000'EF       07E8    432                     L_ACT_PSL,L_EXP_STACK ; check current stack for error
                             05   13  07F0    433            BEQL     10$                ; br = mode is good
                    F829 CF  10   C8  07F2    434 9$:        BISL2    #M_FATAL_ERR,L_FLAGS ; signal fatal error
          F820 CF   000000A0 8F   C8  07F7    435 10$:       BISL2    #M_PSL_ERR!M_ERROR_FLAG,L_FLAGS ; set PSL and error flag
             09 F81B CF      00   E0  0800    436 11$:       BBS      #V_READY,L_FLAGS,12$ ; br = no ready error
          F811 CF   00000080 8F   C8  0806    437            BISL2    #M_ERROR_FLAG,L_FLAGS ; set error flag
             09 F80C CF      02   E1  080F    438 12$:       BBC      #V_EXECUTE_ERR,L_FLAGS,13$ ; br = no execute error
          F802 CF   00000080 8F   C8  0815    439            BISL2    #M_ERROR_FLAG,L_FLAGS ; set error flag
             09 F7FD CF      03   E1  081E    440 13$:       BBC      #V_TIMER,L_FLAGS,14$ ; br = no unexpected timer interrupt
          F7F3 CF   00000080 8F   C8  0824    441            BISL2    #M_ERROR_FLAG,L_FLAGS ; set error flag
                                  05  082D    442 14$:       RSB                         ; return
                                      082E    443
                                      082E    444
                                      082E    445 ; This routine will service any unexpected interval timer interrupts.
                                      082E    446
                                      082E    447            .ALIGN   LONG
                                      0830    448 TIMER_SERVICE:
                 F7EB CF     08   C8  0830    449            BISL2    #M_TIMER,L_FLAGS ; set error flag
                                  02  0835    450            REI                         ; return
                                      0836    451
                                      0836    452
                                      0836    453 ; This routine will clear the buffer area.
                                      0836    454
                                      0836    455 CLEAR_BUFFER:
              55    00000000'FF   DE  0836    456            MOVAL    @A_MCHK_BUFFER,R5 ; get starting buffer address
                         F7BF CF  D4  083D    457            CLRL     L_COUNT            ; initialize counter
                             85   D4  0841    458 1$:        CLRL     (R5)+              ; clear a buffer location
       F4 F7B4 CF   00000100 8F   F3  0843    459            AOBLEQ   #256,L_COUNT,1$ ; br = not finished
```

```
05  084D   460          RSB     .               ; return
    084E   461
    084E   462
    084E   463
    084E   464
    084E   465          $DS_PAGE
```

```
                         084E                 .SBTTL  TEST 5:  Machine Check Exceptions
                     00000000                         .PSECT  TEST_005, PAGE, NOWRT
                         001C
                         001C    468 ;++
                         001C    469 ; Test description:
                         001C    470 ;
                         001C    471 ;        This test checks that a reference to NXM, unaligned reference to
                         001C    472 ;        I/O space, illegal I/O space address, and illegal UNIBUS reference
                         001C    473 ;        will cause machine checks with the proper logout information.
                         001C    474 ;
                         001C    475 ;--
                         001C    476
                         001C    477          $DS_BGNTEST     <MCHK,ALL,DEFAULT>
                         001C        DATA_005:
            00000000     001C                         .LONG   0                 ; TEST ARGUMENT TABLE TERMINATOR
                         0020        TEST_005::
                0000     0020                         .WORD   ^M<>              ; ENTRY MASK
                         0022    478
      00000000'EF   D5   0022    479          TSTL    KA_PTABLE                 ; CPU selected?
               10   18   0028    480          BGEQ    0$                        ; br = selected
                         002A    481          $DS_PRINTF_S    FORMAT=T_NO_KA730 ; print exit warning
      00000028'EF   9F   002A                         PUSHAB  T_NO_KA730
   000100F0 9F  01   FB   0030                         CALLS   #$$N, @#DS$PRINTF
                         0037    482          $DS_EXIT        TEST              ; exit test
             03A8   31   0037                         BRW     TEST_005_X        ; EXIT TEST 5
                         003A    483 0$:
                         003A    484          $DS_SETVEC_S    VECTOR=#SCB$L_TIMER, SRVADR=TIMER_SERVICE
               00   DD   003A                         PUSHL   #0
      00000830'EF   DF   003C                         PUSHAL  TIMER_SERVICE
      000000C0 8F   DD   0042                         PUSHL   #SCB$L_TIMER
   00010160 9F  03   FB   0048                         CALLS   #3, @#DS$SETVEC
   00000000'EF  5E   D0   004F    485 1$:     MOVL    SP,L_KSP                  ; save SP
                         0056    486          $DS_PAGE
```

```
                              0056              .SBTTL  SUBTEST 5.1:  Reference to NXM
                              0056   489 ;+
                              0056   490 ; Subtest description:
                              0056   491 ;
                              0056   492 ;          This subtest attempts to read a nonexistent memory location,
                              0056   493 ;          which should cause a machine check. The machine check logout
                              0056   494 ;          pushed on the stack is checked for the correct information.
                              0056   495 ;
                              0056   496 ; Subtest steps:
                              0056   497 ;
                              0056   498 ;          SUBTEST Reference to NXM
                              0056   499 ;          :  Get Machine Check vector to capture exception
                              0056   500 ;          :  IF unsucessful
                              0056   501 ;          :  :  THEN
                              0056   502 ;          :  :  Report system error
                              0056   503 ;          :  :  Abort test
                              0056   504 ;          :  ENDIF
                              0056   505 ;          :  Setup expected data and load GPR's with data
                              0056   506 ;          :  Set ready to execute flag
                              0056   507 ;          :  Access nonexistent memory (to cause exception)
                              0056   508 ;          :  Set execution error flag
                              0056   509 ;          :  IF no exception
                              0056   510 ;          :  :  THEN
                              0056   511 ;          :  :  Set execution error flag
                              0056   512 ;          :  ENDIF
                              0056   513 ;          :  Check machine check logout and register data
                              0056   514 ;          :  IF error is detected
                              0056   515 ;          :  :  THEN
                              0056   516 ;          :  :  Report data error
                              0056   517 ;          :  ENDIF
                              0056   518 ;          :  IF fatal error flag is set
                              0056   519 ;          :  :  THEN
                              0056   520 ;          :  :  Abort test
                              0056   521 ;          :  ENDIF
                              0056   522 ;          :  Release Machine Check vector
                              0056   523 ;          :  IF unsucessful
                              0056   524 ;          :  :  THEN
                              0056   525 ;          :  :  Report system error
                              0056   526 ;          :  :  Abort test
                              0056   527 ;          :  ENDIF
                              0056   528 ;          :  Push return PC and PSL on stack
                              0056   529 ;          :  Execute an REI
                              0056   530 ;          ENDSUBTEST Reference to NXM
                              0056   531 ;-
                              0056   532
                              0056   533          $DS_BGNSUB
                              0056        T5_S1::
00010030 9F   00000000'EF   FA  0056                    CALLG   $S$, @#DS$BGNSUB
         00000000'8F   00   DA  0061   534       MTPR     #0,#PR$_MCESR            ; clear pending mach check
              00000836'EF   16  0068   535       JSB      CLEAR_BUFFER             ; clear buffer area
                                006E   536       $DS_SETVEC_S    VECTOR=#SCB$L_MACHCHK, SRVADR=READ_GPR
                        00  DD  006E                    PUSHL   #0
              000006EC'EF   DF  0070                    PUSHAL  READ_GPR
                        04  DD  0076                    PUSHL   #SCB$L_MACHCHK
         00010160 9F    03  FB  0078                    CALLS   #3, @#DS$SETVEC
0000000C'EF   000000CD'8F   D0  007F   537 1$:   MOVL     #RENTRY1,RENTRY_POINT    ; load rentry address
              00000020'EF   D4  008A   538       CLRL     L_FLAGS                  ; init flags
```

```
ZZ-E
ENKA
Psec


PSEC
-----
. A
. BL
ENKA
$ABS
TEST
DISP
ARGL
$TST
```

```
     00000000'EF      5E    18   C3  0090    539             SUBL3   #^X18,SP,L_EXP_SP          ; load expected SP
 00000000'EF    00000000'8F      DB  0098    540             MFPR    #PR$_ISP,L_EXP_ISP         ; load expected ISP
 00000000'EF    0000042C'EF      D0  00A3    541             MOVL    DATA_1,L_EXP_PSL           ; load expected PSL
                000006C3'EF      16  00AE    542             JSB     LOAD_GPR                   ; load GPR's with data
       00000020'EF      01       C8  00B4    543             BISL2   #M_READY,L_FLAGS           ; set ready to execute flag
 00000000'EF    00500200'EF      D0  00BB    544 TAG_1:      MOVL    A_NXM,A_MCHK_BUFFER        ; reference non-existent memory
                                     00C6    545                                                ;         to generate machine check
       00000020'EF      04       C8  00C6    546             BISL2   #M_EXECUTE_ERR,L_FLAGS     ; set execution error flag (should
                                     00CD    547                                                ;         skip over if exception occurs)
                                     00CD    548 RENTRY1:
                                     00CD    549             $DS_CLRVEC_S    VECTOR=#SCB$L_MACHCHK
                                04   DD  00CD                        PUSHL   #SCB$L_MACHCHK
       00010168 9F      01       FB  00CF                        CALLS   #1, @#DS$CLRVEC
                                56   D4  00D6    550 3$:         CLRL    R6                         ; init R6
     56    08   00000430'8F      C1  00D8    551             ADDL3   #TABLE1,#8,R6              ; load R6 with address of exp data
                00000744'EF      16  00E0    552             JSB     ERROR_CHECK                ; go check logout info for errors
    3C 00000020'EF      07       E1  00E6    553             BBC     #V_ERROR_FLAG,L_FLAGS,5$ ; br = no error
                                     00EE    554             $DS_ERRHARD_S   UNIT=KA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_BUSERR,P2=#TABLE1
                00000430'8F      DD  00EE                        PUSHL   #TABLE1
                00000089'8F      DD  00F4                        PUSHL   #T_BUSERR
                000004B0'EF      DF  00FA                        PUSHAL  ERR_MESSAGE
                                00   DD  0100                        PUSHL   #0
                00000000'EF      DD  0102                        PUSHL   KA_UNIT_NO
                                01   DD  0108                        PUSHL   #$ER
                                     010A            ;;; TEST 5, SUBTEST 1, ERROR 1
       000100D0 9F      06       FB  010A                        CALLS   #$$M, @#DS$ERRHARD
                                     0111    555             $DS_BCOMPLETE   4$
                             07 50   E8  0111                        BLBS    R0, 4$
                                     0114    556             $DS_ABORT
       00010020 9F      6C       FA  0114                        CALLG   (AP), @#DS$ABORT
    07 00000020'EF      04       E1  011B    557 4$:         BBC     #V_FATAL_ERR,L_FLAGS,5$ ; br = no fatal errors
                                     0123    558             $DS_ABORT
       00010020 9F      6C       FA  0123                        CALLG   (AP), @#DS$ABORT
                                     012A    559 5$:
                                     012A    560             $DS_ENDSUB
                                     012A            T5_S1_X:
 00010038 9F    00000000'EF      FA  012A                        CALLG   $S$, @#DS$ENDSUB
                                     0135    561
                                     0135    562             $DS_PAGE
```

```
ZZ-E
ENKA
Cros

SYMB
----
$$$
$$AR
$$E
$$M

$$N




$$S

$$T1
$ENV
$ER

$MO
$S$

$ST



$TN



ALL
A_IL
A_IL
A_MC


A_NX
A_PS
A_UN
A_WC
BASE
BIT.

BUFS
CEP_
CEP_
CLEA
CPU$
CPU$
CPU$
```

```
                                  0135            .SBTTL  SUBTEST 5.2:  Unaligned reference to I/O space
                                  0135     ;+
                                  0135     ; Subtest description:
                                  0135     ;
                                  0135     ;        This subtest attempts an unaligned reference to I/O space
                                  0135     ;        and checks that a machine check occurs with the correct
                                  0135     ;        logout information on the stack.
                                  0135     ;
                                  0135     ; Subtest steps:
                                  0135     ;
                                  0135     ;        SUBTEST Unaligned reference to I/O space
                                  0135     ;        :  Get Machine Check vector to capture exception
                                  0135     ;        :  IF unsucessful
                                  0135     ;        :  :  THEN
                                  0135     ;        :  :  Report system error
                                  0135     ;        :  :  Abort test
                                  0135     ;        :  ENDIF
                                  0135     ;        :  Setup expected data and load GPR's with data
                                  0135     ;        :  Set ready to execute flag
                                  0135     ;        :  Access unaligned I/O space (to cause exception)
                                  0135     ;        :  Set execution error flag
                                  0135     ;        :  IF no exception
                                  0135     ;        :  :  THEN
                                  0135     ;        :  :  Set execution error flag
                                  0135     ;        :  ENDIF
                                  0135     ;        :  Check machine check logout and register data
                                  0135     ;        :  IF error is detected
                                  0135     ;        :  :  THEN
                                  0135     ;        :  :  Report data error
                                  0135     ;        :  ENDIF
                                  0135     ;        :  IF fatal error flag is set
                                  0135     ;        :  :  THEN
                                  0135     ;        :  :  Abort test
                                  0135     ;        :  ENDIF
                                  0135     ;        :  Release Machine Check vector
                                  0135     ;        :  IF unsucessful
                                  0135     ;        :  :  THEN
                                  0135     ;        :  :  Report system error
                                  0135     ;        :  :  Abort test
                                  0135     ;        :  ENDIF
                                  0135     ;        :  Push return PC and PSL on stack
                                  0135     ;        :  Execute an REI
                                  0135     ;        ENDSUBTEST Unaligned reference to I/O space
                                  0135     ;-
                                  0135
                                  0135            $DS_BGNSUB
                                  0135     T5_S2::
00010030 9F   0000000C'EF     FA  0135                    CALLG   $S$, @#DS$BGNSUB
         00000000'8F   00     DA  0140            MTPR    #0,#PR$_MCESR             ; clear pending mach check
               00000836'EF    16  0147            JSB     CLEAR_BUFFER              ; clear buffer area
                                  014D            $DS_SETVEC_S    VECTOR=#SCB$L_MACHCHK, SRVADR=READ_GPR
                       00     DD  014D                    PUSHL   #0
               000006EC'EF    DF  014F                    PUSHAL  READ_GPR
                       04     DD  0155                    PUSHL   #SCB$L_MACHCHK
         00010160 9F   03     FB  0157                    CALLS   #3, @#DS$SETVEC
0000000C'EF   000001AC'8F     D0  015E     1$:    MOVL    #RENTRY2,RENTRY_POINT     ; load rentry address
               00000020'EF    D4  0169            CLRL    L_FLAGS                   ; init flags
```

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```

```
       00000000'EF    5E   18    C3  016F    615             SUBL3   #^X18,SP,L_EXP_SP           ; load expected SP
   00000000'EF   00000000'8F    DB  0177    616             MFPR    #PR$_ISP,L_EXP_ISP          ; load expected ISP
   00000000'EF   0000042C'EF    D0  0182    617             MOVL    DATA_1,L_EXP_PSL            ; load expected PSL
                 000006C3'EF    16  018D    618             JSB     LOAD_GPR                    ; load GPR's with data
            00000020'EF    01    C8  0193    619             BISL2   #M_READY,L_FLAGS            ; set ready to execute flag
   00000000'EF   00F00001'EF    D0  019A    620 TAG_2:      MOVL    A_UNAL_IO,A_MCHK_BUFFER ; reference unaligned I/O address
                                     01A5    621                                             ;         to generate machine check
            00000020'EF    04    C8  01A5    622             BISL2   #M_EXECUTE_ERR,L_FLAGS  ; set execution error flag (should
                                     01AC    623                                             ;         skip over if exception occurs)
                                     01AC    624 RENTRY2:
                                     01AC    625             $DS_CLRVEC_S    VECTOR=#SCB$L_MACHCHK
                                04   DD  01AC                        PUSHL   #SCB$L_MACHCHK
            00010168 9F         01   FB  01AE                        CALLS   #1, @#DS$CLRVEC
                                56   D4  01B5    626 3$:     CLRL    R6                          ; init R6
       56    08   00000450'8F   C1  01B7    627             ADDL3   #TABLE2,#8,R6               ; load R6 with address of exp data
                  00000744'EF   16  01BF    628             JSB     ERROR_CHECK                 ; go check logout info for errors
         3C 00000020'EF    07    E1  01C5    629             BBC     #V_ERROR_FLAG,L_FLAGS,5$ ; br = no error
                                     01CD    630             $DS_ERRHARD_S    UNIT=KA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_UNALIO_ERR,P2=#TABL
                  00000450'8F   DD  01CD                        PUSHL   #TABLE2
                  000000B6'8F   DD  01D3                        PUSHL   #T_UNALIO_ERR
                  000004B0'EF   DF  01D9                        PUSHAL  ERR_MESSAGE
                          00    DD  01DF                        PUSHL   #0
                  00000000'EF   DD  01E1                        PUSHL   KA_UNIT_NO
                          01    DD  01E7                        PUSHL   #$ER
                                     01E9            ;;; TEST 5, SUBTEST 2, ERROR 1
            000100D0 9F    06    FB  01E9                        CALLS   #$$M, @#DS$ERRHARD
                                     01F0    631             $DS_BCOMPLETE    4$
                        07 50    E8  01F0                        BLBS    R0, 4$
                                     01F3    632             $DS_ABORT
            00010020 9F    6C    FA  01F3                        CALLG   (AP), @#DS$ABORT
         07 00000020'EF    04    E1  01FA    633 4$:     BBC     #V_FATAL_ERR,L_FLAGS,5$ ; br = no fatal errors
                                     0202    634             $DS_ABORT
            00010020 9F    6C    FA  0202                        CALLG   (AP), @#DS$ABORT
                                     0209    635 5$:
                                     0209    636             $DS_ENDSUB
                                     0209        T5_S2_X:
   00010038 9F    0000000C'EF    FA  0209                        CALLG   $S$, @#DS$ENDSUB
                                     0214    637             $DS_PAGE
```

```
                                      0214               .SBTTL  SUBTEST 5.3:  Illegal I/O space address
                                      0214   640 ;+
                                      0214   641 ; Subtest description:
                                      0214   642 ;
                                      0214   643 ;       This subtest attempts an illegal reference to I/O space
                                      0214   644 ;       and checks that a machine check occurs with the correct
                                      0214   645 ;       logout information on the stack.
                                      0214   646 ;
                                      0214   647 ; Subtest steps:
                                      0214   648 ;
                                      0214   649 ;       SUBTEST Illegal I/O space address
                                      0214   650 ;       :  Get Machine Check vector to capture exception
                                      0214   651 ;       :  IF unsucessful
                                      0214   652 ;       :  :  THEN
                                      0214   653 ;       :  :  Report system error
                                      0214   654 ;       :  :  Abort test
                                      0214   655 ;       :  ENDIF
                                      0214   656 ;       :  Setup expected data and load GPR's with data
                                      0214   657 ;       :  Set ready to execute flag
                                      0214   658 ;       :  Access illegal I/O space (to cause exception)
                                      0214   659 ;       :  Set execution error flag
                                      0214   660 ;       :  IF no exception
                                      0214   661 ;       :  :  THEN
                                      0214   662 ;       :  :  Set execution error flag
                                      0214   663 ;       :  ENDIF
                                      0214   664 ;       :  Check machine check logout and register data
                                      0214   665 ;       :  IF error is detected
                                      0214   666 ;       :  :  THEN
                                      0214   667 ;       :  :  Report data error
                                      0214   668 ;       :  ENDIF
                                      0214   669 ;       :  IF fatal error flag is set
                                      0214   670 ;       :  :  THEN
                                      0214   671 ;       :  :  Abort test
                                      0214   672 ;       :  ENDIF
                                      0214   673 ;       :  Release Machine Check vector
                                      0214   674 ;       :  IF unsucessful
                                      0214   675 ;       :  :  THEN
                                      0214   676 ;       :  :  Report system error
                                      0214   677 ;       :  :  Abort test
                                      0214   678 ;       :  ENDIF
                                      0214   679 ;       :  Push return PC and PSL on stack
                                      0214   680 ;       :  Execute an REI
                                      0214   681 ;       ENDSUBTEST Illegal I/O space address
                                      0214   682 ;-
                                      0214   683
                                      0214   684         $DS_BGNSUB
                                      0214        T5_S3::
     00010030 9F    00000018'EF   FA  0214                       CALLG   $S$, a#DS$BGNSUB
                 00000000'8F 00   DA  021F   685        MTPR    #0,#PR$_MCESR          ; clear pending mach check
                   00000836'EF    16  0226   686        JSB     CLEAR_BUFFER           ; clear buffer area
                                      022C   687        $DS_SETVEC_S    VECTOR=#SCB$L_MACHCHK, SRVADR=READ_GPR
                             00   DD  022C                       PUSHL   #0
                  000006EC'EF     DF  022E                       PUSHAL  READ_GPR
                             04   DD  0234                       PUSHL   #SCB$L_MACHCHK
          00010160 9F        03   FB  0236                       CALLS   #3, a#DS$SETVEC
     0000000C'EF   0000028B'8F    D0  023D   688 1$:    MOVL    #RENTRY3,RENTRY_POINT  ; load rentry address
                   00000020'EF    D4  0248   689        CLRL    L_FLAGS                ; init flags
```

```
       00000000'EF   5E   18   C3  024E   690            SUBL3   #^X18,SP,L_EXP_SP         ; load expected SP
   00000000'EF   00000000'8F   DB  0256   691            MFPR    #PR$_ISP,L_EXP_ISP        ; load expected ISP
   00000000'EF   0000042C'EF   D0  0261   692            MOVL    DATA_1,L_EXP_PSL          ; load expected PSL
                 000006C3'EF   16  026C   693            JSB     LOAD_GPR                  ; load GPR's with data
            00000020'EF   01   C8  0272   694            BISL2   #M_READY,L_FLAGS          ; set ready to execute flag
   00000000'EF   00F2A000'EF   D0  0279   695 TAG_3:     MOVL    A_ILL_IO,A_MCHK_BUFFER    ; reference illegal I/O address
                                   0284   696                                              ;         to generate machine check
            00000020'EF   04   C8  0284   697            BISL2   #M_EXECUTE_ERR,L_FLAGS    ; set execution error flag (should
                                   028B   698                                              ;         skip over if exception occurs)
                                   028B   699 RENTRY3:
                                   028B   700            $DS_CLRVEC_S     VECTOR=#SCB$L_MACHCHK
                          04   DD  028B                           PUSHL   #SCB$L_MACHCHK
            00010168 9F   01   FB  028D                           CALLS   #1, @#DS$CLRVEC
                          56   D4  0294   701 3$:        CLRL    R6                        ; init R6
      56   08   00000470'8F    C1  0296   702            ADDL3   #TABLE3,#8,R6             ; load R6 with address of exp data
                 00000744'EF   16  029E   703            JSB     ERROR_CHECK               ; go check logout info for errors
        3C 00000020'EF    07   E1  02A4   704            BBC     #V_ERROR_FLAG,L_FLAGS,5$ ; br = no error
                                   02AC   705            $DS_ERRHARD_S    UNIT=KA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_ILLIO_ERR,P2=#TABLE
                 00000470'8F   DD  02AC                           PUSHL   #TABLE3
                 000000DE'8F   DD  02B2                           PUSHL   #T_ILLIO_ERR
                 000004B0'EF   DF  02B8                           PUSHAL  ERR_MESSAGE
                          00   DD  02BE                           PUSHL   #0
                 00000000'EF   DD  02C0                           PUSHL   KA_UNIT_NO
                          01   DD  02C6                           PUSHL   #$ER
                                   02C8         ;;; TEST 5, SUBTEST 3, ERROR 1
            000100D0 9F   06   FB  02C8                           CALLS   #$$M, @#DS$ERRHARD
                                   02CF   706            $DS_BCOMPLETE    4$
                       07 50   E8  02CF                           BLBS    R0, 4$
                                   02D2   707            $DS_ABORT
            00010020 9F   6C   FA  02D2                           CALLG   (AP), @#DS$ABORT
        07 00000020'EF    04   E1  02D9   708 4$:        BBC     #V_FATAL_ERR,L_FLAGS,5$ ; br = no fatal errors
                                   02E1   709            $DS_ABORT
            00010020 9F   6C   FA  02E1                           CALLG   (AP), @#DS$ABORT
                                   02E8   710 5$:
                                   02E8   711            $DS_ENDSUB
                                   02E8         T5_S3_X:
   00010038 9F   00000018'EF   FA  02E8                           CALLG   $S$, @#DS$ENDSUB
                                   02F3   712            $DS_PAGE
```

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```
                              02F3           .SBTTL  SUBTEST 5.4:  Illegal UNIBUS reference
                              02F3   715 ;+
                              02F3   716 ; Subtest description:
                              02F3   717 ;
                              02F3   718 ;         This subtest attempts an illegal UNIBUS reference
                              02F3   719 ;         and checks that a machine check occurs with the correct
                              02F3   720 ;         logout information on the stack.
                              02F3   721 ;
                              02F3   722 ; Subtest steps:
                              02F3   723 ;
                              02F3   724 ;         SUBTEST Illegal UNIBUS reference
                              02F3   725 ;         :  Get Machine Check vector to capture exception
                              02F3   726 ;         :  IF unsucessful
                              02F3   727 ;         :  :  THEN
                              02F3   728 ;         :  :  Report system error
                              02F3   729 ;         :  :  Abort test
                              02F3   730 ;         :  ENDIF
                              02F3   731 ;         :  Setup expected data and load GPR's with data
                              02F3   732 ;         :  Set ready to execute flag
                              02F3   733 ;         :  Access illegal UNIBUS address (to cause exception)
                              02F3   734 ;         :  Set execution error flag
                              02F3   735 ;         :  IF no exception
                              02F3   736 ;         :  :  THEN
                              02F3   737 ;         :  :  Set execution error flag
                              02F3   738 ;         :  ENDIF
                              02F3   739 ;         :  Check machine check logout and register data
                              02F3   740 ;         :  IF error is detected
                              02F3   741 ;         :  :  THEN
                              02F3   742 ;         :  :  Report data error
                              02F3   743 ;         :  ENDIF
                              02F3   744 ;         :  IF fatal error flag is set
                              02F3   745 ;         :  :  THEN
                              02F3   746 ;         :  :  Abort test
                              02F3   747 ;         :  ENDIF
                              02F3   748 ;         :  Release Machine Check vector
                              02F3   749 ;         :  IF unsucessful
                              02F3   750 ;         :  :  THEN
                              02F3   751 ;         :  :  Report system error
                              02F3   752 ;         :  :  Abort test
                              02F3   753 ;         :  ENDIF
                              02F3   754 ;         :  Push return PC and PSL on stack
                              02F3   755 ;         :  Execute an REI
                              02F3   756 ;         ENDSUBTEST Illegal UNIBUS reference
                              02F3   757 ;-
                              02F3   758
                              02F3   759         $DS_BGNSUB
                              02F3       T5_S4::
 00010030 9F    00000024'EF   FA  02F3                   CALLG   $S$, @#DS$BGNSUB
         00000000'8F   00     DA  02FE   760         MTPR    #0,#PR$_MCESR          ; clear pending mach check
                00000836'EF   16  0305   761         JSB     CLEAR_BUFFER           ; clear buffer area
                                  030B   762         $DS_SETVEC_S    VECTOR=#SCB$L_MACHCHK, SRVADR=READ_GPR
                       00     DD  030B                   PUSHL   #0
                000006EC'EF   DF  030D                   PUSHAL  READ_GPR
                       04     DD  0313                   PUSHL   #SCB$L_MACHCHK
         00010160 9F   03     FB  0315                   CALLS   #3, @#DS$SETVEC
0000000C'EF   0000036A'8F     D0  031C   763 1$:     MOVL    #RENTRY4,RENTRY_POINT  ; load rentry address
                00000020'EF   D4  0327   764         CLRL    L_FLAGS                ; init flags
```

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```

```
     00000000'EF    5E    18    C3  032D   765              SUBL3   #^X18,SP,L_EXP_SP           ; load expected SP
   00000000'EF    00000000'8F   DB  0335   766              MFPR    #PR$_ISP,L_EXP_ISP          ; load expected ISP
   00000000'EF    0000042C'EF   D0  0340   767              MOVL    DATA_1,L_EXP_PSL            ; load expected PSL
                  000006C3'EF   16  034B   768              JSB     LOAD_GPR                    ; load GPR's with data
         00000020'EF      01    C8  0351   769              BISL2   #M_READY,L_FLAGS            ; set ready to execute flag
   00000000'EF    00FC0000'EF   D0  0358   770 TAG_4:       MOVL    A_ILL_UB,A_MCHK_BUFFER      ; reference illegal unibus address
                                    0363   771                                                  ;         to generate machine check
         00000020'EF      04    C8  0363   772              BISL2   #M_EXECUTE_ERR,L_FLAGS      ; set execution error flag (should
                                    036A   773                                                  ;         skip over if exception occurs)
                                    036A   774 RENTRY4:
                                    036A   775              $DS_CLRVEC_S      VECTOR=#SCB$L_MACHCHK
                          04    DD  036A                              PUSHL   #SCB$L_MACHCHK
         00010168 9F      01    FB  036C                              CALLS   #1, @#DS$CLRVEC
                          56    D4  0373   776 3$:          CLRL    R6                          ; init R6
      56    08    00000490'8F   C1  0375   777              ADDL3   #TABLE4,#8,R6               ; load R6 with address of exp data
                  00000744'EF   16  037D   778              JSB     ERROR_CHECK                 ; go check logout info for errors
       3C 00000020'EF     07    E1  0383   779              BBC     #V_ERROR_FLAG,L_FLAGS,5$ ; br = no error
                                    038B   780              $DS_ERRHARD_S     UNIT=KA_UNIT_NO,PRLINK=ERR_MESSAGE,P1=#T_ILLUB_ERR,P2=#TABLE
                  00000490'8F   DD  038B                              PUSHL   #TABLE4
                  00000104'8F   DD  0391                              PUSHL   #T_ILLUB_ERR
                  000004B0'EF   DF  0397                              PUSHAL  ERR_MESSAGE
                          00    DD  039D                              PUSHL   #0
                  00000000'EF   DD  039F                              PUSHL   KA_UNIT_NO
                          01    DD  03A5                              PUSHL   #$ER
                                    03A7          ;;; TEST 5, SUBTEST 4, ERROR 1
         000100D0 9F      06    FB  03A7                              CALLS   #$$M, @#DS$ERRHARD
                                    03AE   781              $DS_BCOMPLETE     4$
                       07 50    E8  03AE                              BLBS    R0, 4$
                                    03B1   782              $DS_ABORT
         00010020 9F      6C    FA  03B1                              CALLG   (AP), @#DS$ABORT
       07 00000020'EF     04    E1  03B8   783 4$:          BBC     #V_FATAL_ERR,L_FLAGS,5$ ; br = no fatal errors
                                    03C0   784              $DS_ABORT
         00010020 9F      6C    FA  03C0                              CALLG   (AP), @#DS$ABORT
                                    03C7   785 5$:
                                    03C7   786              $DS_ENDSUB
                                    03C7          T5_S4_X:
   00010038 9F    00000024'EF   FA  03C7                              CALLG   $S$, @#DS$ENDSUB
                                    03D2   787
                                    03D2   788              $DS_CLRVEC_S      VECTOR=#SCB$L_TIMER
               000000C0 8F      DD  03D2                              PUSHL   #SCB$L_TIMER
         00010168 9F      01    FB  03D8                              CALLS   #1, @#DS$CLRVEC
                                    03DF   789              $DS_ENDTEST
                    50    01    D0  03DF                              MOVL    #1, R0              ; NORMAL EXIT
                                    03E2          TEST_005_X::
         00010058 9F      6E    FA  03E2                              CALLG   (SP), @#DS$BREAK
                                04  03E9                              RET                         ; RETURN TO TEST SEQUENCER
                                    03EA   790              $DS_ENDMOD
                                00000000                              .PSECT  $TSTCNT, NOEXE, NOWRT, OVR, LONG
                         00000005   0000                              .LONG   $TN
                                    0004   791              .END
```

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```
$$$                            = 00000024 R     06     DS$FREEDBGSYM                    000101B8
$$ARGS                         = 0000000A              DS$GETBUF                        00010120
$$E                            = 00000001              DS$GETMEM                        00010130
$$M                            = 00000006              DS$GPHARD                        00010018
$$N                            = 00000001              DS$HELP                          000101B0
$$S                            = FFFFFFFF              DS$INITSCB                       00010170
$$T1                           = 0000002C              DS$INLOOP                        00010048
$ENV                           = 00000001  G           DS$K_ERROR                     = 00000002
$ER                            = FFFFFFFF              DS$K_NORMAL                    = 00000001
$MO                            = 00000001  G           DS$K_SEVERE                    = 00000004
$S$                            = 00000024 R     06     DS$K_SUBSYS                    = 00000066
$ST                            = 00000000              DS$K_WARNING                   = 00000000
$TN                            = 00000005              DS$LOAD                          00010198
ALL                            = 00000008  G           DS$LOADPCS                       000101C0
A_ILL_IO                       = 00F2A000              DS$MAPDBGBLOCK                   00010118
A_ILL_UB                       = 00FC0000              DS$MMOFF                         00010158
A_MCHK_BUFFER                    ********   X   02     DS$MMON                          00010150
A_NXM                          = 00500200              DS$MOVPHY                        00010148
A_PSLMNE                         ********   X   02     DS$MOVVRT                        00010140
A_UNAL_IO                      = 00F00001              DS$PARSE                         000100B8
A_WCS_ADDRESS                    00000024 R     02     DS$PRINTB                        000100E0
BASE_005                         00000000 R     04     DS$PRINTF                        000100F0
BIT...                         = 0000001A              DS$PRINTS                        000100F8
BUFSIZ                         = 00000080              DS$PRINTSIG                      00010100
CEP_FUNCTIONAL                 = 00000000              DS$PRINTX                        000100E8
CEP_REPAIR                     = 00000001              DS$PROBE                         000101A0
CLEAR_BUFFER                     00000836 R     02     DS$RELBUF                        00010128
CPU$V_COMET                    = 00000002              DS$RELMEM                        00010138
CPU$V_HS                       = 00000000              DS$SETIPL                        00010178
CPU$V_STAR                     = 00000001              DS$SETMAP                        00010188
DATA_005                         0000001C R     04     DS$SETPRIEXV                     00010110
DATA_1                           0000042C R     02     DS$SETVEC                        00010160
DEFAULT                        = 00000000  G           DS$SHOCHAN                       00010190
DS$ABORT                         00010020              DS$SUMMARY                       00010028
DS$ASKADR                        00010090              DS$WAITMS                        00010060
DS$ASKDATA                       00010080              DS$WAITUS                        00010068
DS$ASKLGCL                       00010098              DS$_ARITH                      = 006600D0
DS$ASKSTR                        000100A0              DS$_BADLINK                    = 006600F0
DS$ASKVLD                        00010088              DS$_BADTYPE                    = 006600E8
DS$ATTACH                        000101A8              DS$_CHME                       = 006600A8
DS$BGNSUB                        00010030              DS$_CHMK                       = 006600E0
DS$BRANCH                        000100A8              DS$_DEVNAME                    = 00660108
DS$BREAK                         00010058              DS$_ERROR                      = 00660002
DS$CANWAIT                       00010070              DS$_FHWE                       = 00660068
DS$CHANNEL                       00010180              DS$_FRAGBUF                    = 00660080
DS$CKLOOP                        00010040              DS$_ICBUSY                     = 006600C8
DS$CLRVEC                        00010168              DS$_ICERR                      = 006600C0
DS$CNTRLC                        00010078              DS$_IHWE                       = 00660060
DS$CVTREG                        000100B0              DS$_ILLCHAR                    = 00660018
DS$ENDPASS                       00010010              DS$_ILLPAGCNT                  = 00660078
DS$ENDSUB                        00010038              DS$_ILLUNIT                    = 00660100
DS$ERRDEV                        000100C8              DS$_INSFMEM                    = 00660050
DS$ERRHARD                       000100D0              DS$_IPL2HI                     = 006600B8
DS$ERRPREP                       00010108              DS$_IVADDR                     = 00660040
DS$ERRSOFT                       000100D8              DS$_IVVECT                     = 00660038
DS$ERRSYS                        000100C0              DS$_KRNLSTK                    = 00660090
DS$ESCAPE                        00010050              DS$_LOGIC                      = 00660070
```

```
DS$_MCHK                         = 00660088          DSA$M_USER                     = 10000000
DS$_MMOFF                        = 00660058          DSA$M_VERIFY                   = 00000200
DS$_NEEDUNIT                     = 006600F8          DSA$V_APT                      = 0000001F
DS$_NOPCS                        = 00660110          DSA$V_BELL                     = 00000003
DS$_NORMAL                       = 00660001          DSA$V_BINARY                   = 00000001
DS$_NOSUPPORT                    = 006600B1          DSA$V_CRD_AUTOTEST             = 0000000B
DS$_NOTDON                       = 00660030          DSA$V_CRD_MENUTEST             = 00000010
DS$_NOTIMP                       = 006600B0          DSA$V_CRD_TRACE                = 00000011
DS$_NULLSTR                      = 00660010          DSA$V_DEBUG                    = 0000001A
DS$_OVERFLOW                     = 00660008          DSA$V_HALT                     = 00000000
DS$_POWER                        = 00660098          DSA$V_IE1                      = 00000004
DS$_PROGERR                      = 00660020          DSA$V_IE2                      = 00000005
DS$_SEVERE                       = 00660004          DSA$V_IE3                      = 00000006
DS$_TRANSL                       = 006600A0          DSA$V_IES                      = 00000007
DS$_TRUNCATE                     = 00660028          DSA$V_LOAD_DEBUGGER            = 0000001E
DS$_UNEXPINT                     = 006600D8          DSA$V_LOOP                     = 00000002
DS$_VASFULL                      = 00660048          DSA$V_NORPT                    = 0000001B
DS$_WARNING                      = 00660000          DSA$V_OPER                     = 0000000C
DSA$AL_APTMAIL                     0000FE00          DSA$V_PASSO                    = 0000001D
DSA$AT_APTTXT                      0000FA00          DSA$V_PROMPT                   = 0000000D
DSA$GL_APTCOM                      0000FE04          DSA$V_QA                       = 0000000F
DSA$GL_DEVLEN                      0000FE58          DSA$V_QUICK                    = 00000008
DSA$GL_ERRNO                       0000FE44          DSA$V_SEARCH                   = 0000000E
DSA$GL_EVENT                       0000FE48          DSA$V_TRACE                    = 0000000A
DSA$GL_FLAGS                       0000FE00          DSA$V_USER                     = 0000001C
DSA$GL_MSGTYP                      0000FE40          DSA$V_VERIFY                   = 00000009
DSA$GL_PASSES                      0000FE08          ENV$M_DOMAIN                   = 00000002
DSA$GL_PASSNO                      0000FE54          ENV$M_LEVEL                    = 00000001
DSA$GL_SECTNO                      0000FE10          ENV$M_SUPER                    = 000003FC
DSA$GL_SID                         0000FE14          ENV$S_DOMAIN                   = 00000001
DSA$GL_SUBTNO                      0000FE4C          ENV$S_LEVEL                    = 00000001
DSA$GL_TESTNO                      0000FE50          ENV$S_SUPER                    = 00000008
DSA$GL_UNITS                       0000FE0C          ENV$V_DOMAIN                   = 00000001
DSA$GQ_MSGPTR                      0000FE68          ENV$V_LEVEL                    = 00000000
DSA$GT_DEVNAM                      0000FE5C          ENV$V_SUPER                    = 00000002
DSA$M_APT                        = 80000000          ENV$_CPU                       = 00000000
DSA$M_BELL                       = 00000008          ENV$_FUNCTIONAL                = 00000000
DSA$M_BINARY                     = 00000002          ENV$_REPAIR                    = 00000001
DSA$M_CRD_AUTOTEST               = 00000800          ENV$_SUPER                     = 00000001
DSA$M_CRD_MENUTEST               = 00010000          ENV$_SYSTEM                    = 00000001
DSA$M_CRD_TRACE                  = 00020000          ERR$_MSGADR                    = 0000000C
DSA$M_DEBUG                      = 04000000          ERR$_NARGS                     = 0000000A
DSA$M_HALT                       = 00000001          ERR$_NUM                       = 00000004
DSA$M_IE1                        = 00000010          ERR$_P1                        = 00000014
DSA$M_IE2                        = 00000020          ERR$_P2                        = 00000018
DSA$M_IE3                        = 00000040          ERR$_P3                        = 0000001C
DSA$M_IES                        = 00000080          ERR$_P4                        = 00000020
DSA$M_LOAD_DEBUGGER              = 40000000          ERR$_P5                        = 00000024
DSA$M_LOOP                       = 00000004          ERR$_P6                        = 00000028
DSA$M_NORPT                      = 08000000          ERR$_POINTER                   = 00000010
DSA$M_OPER                       = 00001000          ERR$_UNIT                      = 00000008
DSA$M_PASSO                      = 20000000          ERROR_CHECK                      00000744 R      02
DSA$M_PROMPT                     = 00002000          ERR_MESSAGE                      000004B0 R      02
DSA$M_QA                         = 00008000          GPR_TABLE                        ********   X    02
DSA$M_QUICK                      = 00000100          HALT                           = 00000004  G
DSA$M_SEARCH                     = 00004000          HP$A_DEPENDENT                   00000032
DSA$M_TRACE                      = 00000400          HP$A_DEVICE                      00000018
```

```
HP$A_DVA                         0000001C                  L_COUNT                            00000000 R      02
HP$A_LINK                        00000020                  L_CUR_ISP                          00000008 R      02
HP$B_DRIVE                       0000000B                  L_DATA                           = 00000000
HP$B_FLAGS                       0000000A                  L_EXP_AP                           ********   X    02
HP$M_ALLOC                     = 00000001                  L_EXP_FP                           ********   X    02
HP$M_WASALL                    = 00000002                  L_EXP_ISP                          ********   X    02
HP$Q_DEVICE                      00000000                  L_EXP_MOD                          00000010 R      02
HP$T_DEVICE                      0000000C                  L_EXP_PSL                          ********   X    02
HP$T_TYPE                        00000026                  L_EXP_SP                           ********   X    02
HP$V_ALLOC                     = 00000000                  L_EXP_STACK                        00000014 R      02
HP$V_WASALL                    = 00000001                  L_FLAGS                            00000020 R      02
HP$W_SIZE                        00000008                  L_KSP                              ********   X    04
HP$W_VECTOR                      00000024                  L_TIMER                            0000001C R      02
IPR                            = 00000006   G              MANUAL                           = 00000001   G
KA$B_ACC_TYPE                    00000042                  MCHK                             = 00000005   G
KA$B_RESERVED                    00000043                  MEM                              = 00000009   G
KA$B_SID_TYPE                    0000003D                  MODELIST                           ********   X    02
KA$K_LEN                         00000046                  MSG_005                            00000002 R      04
KA$L_FLAGS                       00000032                  M_BIT19                          = 00080000
KA$L_SID                         0000003A                  M_BIT20                          = 00100000
KA$M_CHAR                      = 00000100                  M_DONE                           = 00000002
KA$M_CRC                       = 00000010                  M_ERROR_FLAG                     = 00000080
KA$M_D_FLOAT                   = 00000002                  M_EXECUTE_ERR                    = 00000004
KA$M_EDIT                      = 00000080                  M_FATAL_ERR                      = 00000010
KA$M_F_FLOAT                   = 00000001                  M_GPR_ERR                        = 00000040
KA$M_G_FLOAT                   = 00000004                  M_INT                            = 00002000
KA$M_H_FLOAT                   = 00000008                  M_ISP_ERR                        = 00000200
KA$M_PACKED                    = 00000020                  M_MCINT                          = 00004000
KA$M_PACK_MUL                  = 00000040                  M_MC_ERR                         = 00001000
KA$M_SB_ERR                    = 02000000                  M_PSL_ERR                        = 00000020
KA$M_TODR                      = 00010000                  M_READY                          = 00000001
KA$M_WCS_LD                    = 01000000                  M_SP_ERR                         = 00000400
KA$V_CHAR                      = 00000008                  M_TIMER                          = 00000008
KA$V_CRC                       = 00000004                  PAR$M_ATDEF                      = 00000010
KA$V_D_FLOAT                   = 00000001                  PAR$M_ATHI                       = 00000008
KA$V_EDIT                      = 00000007                  PAR$M_ATLO                       = 00000004
KA$V_F_FLOAT                   = 00000000                  PAR$M_NODEF                      = 00000002
KA$V_G_FLOAT                   = 00000002                  PAR$V_ATDEF                      = 00000004
KA$V_H_FLOAT                   = 00000003                  PAR$V_ATHI                       = 00000003
KA$V_PACKED                    = 00000005                  PAR$V_ATLO                       = 00000002
KA$V_PACK_MUL                  = 00000006                  PAR$V_NODEF                      = 00000001
KA$V_SB_ERR                    = 00000019                  PAR$_BIN                         = 00000002
KA$V_TODR                      = 00000010                  PAR$_DEC                         = 0000000A
KA$V_WCS_LD                    = 00000018                  PAR$_HEX                         = 00000010
KA$W_LATENCY                     0000003E                  PAR$_NO                          = 00000000
KA$W_MEM_SIZE                    00000044                  PAR$_OCT                         = 00000008
KA$W_PROGRESS                    00000040                  PAR$_YES                         = 00000001
KA$W_RESERVED                    00000038                  POWER                            = 00000003   G
KA$W_WCS                         00000036                  PR$_ISP                            ********   X    02
KA_PTABLE                        ********   X    04        PR$_MCESR                          ********   X    02
KA_UNIT_NO                       ********   X    04        PSL$C_EXEC                       = 00000001
LDPCTX                         = 0000000B   G              PSL$C_KERNEL                     = 00000000
LOAD_GPR                         000006C3 R      02        PSL$C_SUPER                      = 00000002
L_ACT_ISP                        ********   X    02        PSL$C_USER                       = 00000003
L_ACT_PSL                        ********   X    02        PSL$K_EXEC                       = 00000001
L_ACT_SP                         ********   X    02        PSL$K_KERNEL                     = 00000000
L_ADDRESS                        00000004 R      02        PSL$K_SUPER                      = 00000002
```

```
PSL$K_USER                   = 00000003                SCB$L_COMPAT                        00000030
PSL$M_C                      = 00000001                SCB$L_KNLSTK                        00000008
PSL$M_CBIT                   = 00000001                SCB$L_MACHCHK                       00000004
PSL$M_CM                     = 80000000                SCB$L_OPCCUS                        00000014
PSL$M_CURMOD                 = 03000000                SCB$L_OPCDEC                        00000010
PSL$M_DV                     = 00000080                SCB$L_POWER                         0000000C
PSL$M_FPD                    = 08000000                SCB$L_RADRMOD                       0000001C
PSL$M_FU                     = 00000040                SCB$L_ROPRAND                       00000018
PSL$M_IPL                    = 001F0000                SCB$L_RXDB                          000000F8
PSL$M_IS                     = 04000000                SCB$L_SFTLVL1                       00000084
PSL$M_IV                     = 00000020                SCB$L_SFTLVL10                      000000A8
PSL$M_N                      = 00000008                SCB$L_SFTLVL11                      000000AC
PSL$M_NBIT                   = 00000008                SCB$L_SFTLVL12                      000000B0
PSL$M_PRVMOD                 = 00C00000                SCB$L_SFTLVL13                      000000B4
PSL$M_SAFBITS                = 000037FF                SCB$L_SFTLVL14                      000000B8
PSL$M_TBIT                   = 00000010                SCB$L_SFTLVL15                      000000BC
PSL$M_TP                     = 40000000                SCB$L_SFTLVL2                       00000088
PSL$M_V                      = 00000002                SCB$L_SFTLVL3                       0000008C
PSL$M_VBIT                   = 00000002                SCB$L_SFTLVL4                       00000090
PSL$M_Z                      = 00000004                SCB$L_SFTLVL5                       00000094
PSL$M_ZBIT                   = 00000004                SCB$L_SFTLVL6                       00000098
PSL$S_CURMOD                 = 00000002                SCB$L_SFTLVL7                       0000009C
PSL$S_IPL                    = 00000005                SCB$L_SFTLVL8                       000000A0
PSL$S_PRVMOD                 = 00000002                SCB$L_SFTLVL9                       000000A4
PSL$V_C                      = 00000000                SCB$L_TBIT                          00000028
PSL$V_CBIT                   = 00000000                SCB$L_TIMER                         000000C0
PSL$V_CM                     = 0000001F                SCB$L_TRANSL                        00000024
PSL$V_CURMOD                 = 00000018                SCB$L_TXDB                          000000FC
PSL$V_DV                     = 00000007                SCB$L_ZERO                          00000000
PSL$V_FPD                    = 0000001B                SEP_FUNCTIONAL                    = 00000002
PSL$V_FU                     = 00000006                SEP_REPAIR                        = 00000003
PSL$V_IPL                    = 00000010                SIZ...                            = 00000001
PSL$V_IS                     = 0000001A                SYS$ALLOC                           00010238
PSL$V_IV                     = 00000005                SYS$ASCTIM                          00010248
PSL$V_N                      = 00000003                SYS$ASSIGN                          00010250
PSL$V_NBIT                   = 00000003                SYS$BINTIM                          00010258
PSL$V_PRVMOD                 = 00000016                SYS$CANCEL                          00010260
PSL$V_TBIT                   = 00000004                SYS$CANTIM                          00010268
PSL$V_TP                     = 0000001E                SYS$CLOSE                           000105B8
PSL$V_V                      = 00000001                SYS$CLREF                           00010298
PSL$V_VBIT                   = 00000001                SYS$CONNECT                         000105C0
PSL$V_Z                      = 00000002                SYS$DALLOC                          000102D8
PSL$V_ZBIT                   = 00000002                SYS$DASSGN                          000102E0
READ_GPR                       000006EC R      02      SYS$DISCONNECT                      000105D0
REG_TABLE                      ********    X   02      SYS$FAO                             00010350
RENTRY1                        000000CD R      04      SYS$FAOL                            00010358
RENTRY2                        000001AC R      04      SYS$GET                             00010580
RENTRY3                        0000028B R      04      SYS$GETCHN                          000104C8
RENTRY4                        0000036A R      04      SYS$GETTIM                          00010378
RENTRY_POINT                   0000000C R      02      SYS$LKWSET                          000103A0
SCB$L_ACCESS                   00000020                SYS$NUMTIM                          000103B8
SCB$L_ARITH                    00000034                SYS$OPEN                            00010608
SCB$L_BREAK                    0000002C                SYS$QIO                             000103C8
SCB$L_CHME                     00000044                SYS$QIOW                            00010200
SCB$L_CHMK                     00000040                SYS$READ                            00010590
SCB$L_CHMS                     00000048                SYS$READEF                          000103D0
SCB$L_CHMU                     0000004C                SYS$SETAST                          000103F8
```

```
SYS$SETEF                        00010400                 T_UNEXP_DATA                     0000016B R       02
SYS$SETIMR                       00010420                 T_XOR                            000003C4 R       02
SYS$SETPRI                       00010428                 UBI                            = 0000000A  G
SYS$SETPRT                       00010430                 V_DONE                         = 00000001
SYS$SETRWM                       00010438                 V_ERROR_FLAG                   = 00000007
SYS$SETSWM                       00010448                 V_EXECUTE_ERR                  = 00000002
SYS$ULKPAG                       00010460                 V_FATAL_ERR                    = 00000004
SYS$ULWSET                       00010468                 V_GPR_ERR                      = 00000006
SYS$UNWIND                       00010470                 V_INT                          = 0000000D
SYS$WAITFR                       00010478                 V_ISP_ERR                      = 00000009
SYS$WFLAND                       00010488                 V_MCINT                        = 0000000E
SYS$WFLOR                        00010490                 V_MC_ERR                       = 0000000C
T5_S1                            00000056 RG       04     V_PSL_ERR                      = 00000005
T5_S1_X                          0000012A R        04     V_READY                        = 00000000
T5_S2                            00000135 RG       04     V_SP_ERR                       = 0000000A
T5_S2_X                          00000209 R        04     V_TIMER                        = 00000003
T5_S3                            00000214 RG       04     WCS                            = 00000007  G
T5_S3_X                          000002E8 R        04
T5_S4                            000002F3 RG       04
T5_S4_X                          000003C7 R        04
TABLE1                           00000430 R        02
TABLE2                           00000450 R        02
TABLE3                           00000470 R        02
TABLE4                           00000490 R        02
TAG_1                            000000BB R        04
TAG_2                            0000019A R        04
TAG_3                            00000279 R        04
TAG_4                            00000358 R        04
TEST_005                         00000020 RG       04
TEST_005_X                       000003E2 RG       04
TIMER_SERVICE                    00000830 R        02
TU58                           = 00000002  G
T_ACT_PSL                        00000364 R        02
T_BAD_DATA                       000002B2 R        02
T_BUSERR                         00000089 R        02
T_EXECUTE                        000001D2 R        02
T_EXPECTED                       0000015E R        02
T_EXP_PSL                        00000343 R        02
T_GOOD_DATA                      000002DB R        02
T_GPR                            0000039C R        02
T_GPR_ERR                        00000289 R        02
T_ILLIO_ERR                      000000DE R        02
T_ILLUB_ERR                      00000104 R        02
T_ISP_ERR                        0000021F R        02
T_MC_ERR                         0000012D R        02
T_MC_MESS                        00000060 R        02
T_NOT_ON_IS                      0000031C R        02
T_NOT_ON_KS                      000002F8 R        02
T_NOT_READY                      000001A0 R        02
T_NOXOR                          000003E0 R        02
T_NO_KA730                       00000028 R        02
T_NO_WCS                         000003F6 R        02
T_PSL                            00000383 R        02
T_SP_ERR1                        00000253 R        02
T_SP_ERR2                        0000027D R        02
T_TIMER                          000001F7 R        02
T_UNALIO_ERR                     000000B6 R        02
```

```
                                        +----------------+
                                        ! Psect synopsis !
                                        +----------------+

PSECT name                 Allocation          PSECT No.  Attributes
----------                 ----------          ---------  ----------
.  ABS  .                  00000000  (     0.)  00 (  0.)  NOPIC   USR   CON   ABS   LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
. BLANK .                  00000000  (     0.)  01 (  1.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD     WRT NOVEC BYTE
ENKAXF                     0000084E  (  2126.)  02 (  2.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
$ABS$                      00010610  (67088.)  03 (  3.)  NOPIC   USR   CON   ABS   LCL NOSHR   EXE   RD     WRT NOVEC BYTE
TEST_005                   000003EA  (  1002.)  04 (  4.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
DISPATCH                   00000018  (    24.)  05 (  5.)  NOPIC   USR   CON   REL   LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
ARGLIST                    00000030  (    48.)  06 (  6.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD   NOWRT NOVEC LONG
$TSTCNT                    00000004  (     4.)  07 (  7.)  NOPIC   USR   OVR   REL   LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
```

```
ZZ-EN
ENKAX
Cross

$DS_F
$DS_F
$DS_F
$DS_F
$DS_S
$DS_S
$DS_S
$DS_S
$EQU
$EQUL
$EQUL
$GBLI

$HP_D
$KADE
$OFFD
$PSLD
$PUSH

$VIEL

$VIEL

ENKAX

Phase
-----
Init
Comma
Pass
Symbo
Pass
Symbo
Psect
Cross
Assem

The
1424
There
791
125
```

```
                                         +--------------------------+
                                         ! Symbol Cross Reference !
                                         +--------------------------+
SYMBOL                       VALUE       DEFINITION       REFERENCES...
------                       -----       ----------       -------------
$$$                         =00000024-R  759      (13)     533    (10)     609    (11)     684    (12)     759    (13)
$$ARGS                      =0000000A    75       (2)      75     (2)
$$E                         =00000001    759      (13)     560    (10)     636    (11)     711    (12)     786    (13)
$$M                         =00000006    780      (13)     477    (9)      554    (10)     630    (11)     705    (12)
                                                           780    (13)
$$N                         =00000001    780      (13)    #-292   (7)     #-293   (7)     #-295   (7)     #-299   (7)
                                                          #-302   (7)     #-304   (7)      306    (7)      308    (7)
                                                           310    (7)      316    (7)      320    (7)      325    (7)
                                                          #-327   (7)      335    (7)      337    (7)     #-340   (7)
                                                          #-481   (9)      554    (10)     630    (11)     705    (12)
                                                           780    (13)     80     (2)
$$S                         =FFFFFFFF    789      (13)     467    (9)      477    (9)      488    (10)     533    (10)
                                                           564    (11)     609    (11)     639    (12)     684    (12)
                                                           714    (13)     759    (13)
$$T1                        =0000002C    75       (2)      75     (2)
$ENV                        =00000001    58       (2)
$ER                         =FFFFFFFF    789      (13)     533    (10)    #-554   (10)     609    (11)    #-630   (11)
                                                           684    (12)    #-705   (12)     759    (13)    #-780   (13)
$MO                         =00000001    790      (13)     790    (13)
$S$                         =00000024-R  759      (13)     533    (10)     560    (10)     609    (11)     636    (11)
                                                           684    (12)     711    (12)     759    (13)     786    (13)
$ST                         =00000000    789      (13)     477    (9)      488    (10)     533    (10)     554    (10)
                                                           560    (10)     564    (11)     609    (11)     630    (11)
                                                           636    (11)     639    (12)     684    (12)     705    (12)
                                                           711    (12)     714    (13)     759    (13)     780    (13)
                                                           786    (13)     789    (13)
$TN                         =00000005    790      (13)     467    (9)      477    (9)      482    (9)      488    (10)
                                                           554    (10)     564    (11)     630    (11)     639    (12)
                                                           705    (12)     714    (13)     780    (13)     789    (13)
                                                           790    (13)
ALL                         =00000008    80       (2)      477    (9)
A_ILL_IO                    =00F2A000    130      (2)      267    (6)     #-695   (12)
A_ILL_UB                    =00FC0000    131      (2)      277    (6)     #-770   (13)
A_MCHK_BUFFER                00000000-XR                  #-296   (7)     #-329   (7)     #-371   (8)     #-372   (8)
                                                          #-402   (8)      456    (8)     #-544   (10)    #-620   (11)
                                                          #-695   (12)    #-770   (13)
A_NXM                       =00500200    128      (2)      247    (6)     #-544   (10)
A_PSLMNE                     00000000-XR                   315    (7)      319    (7)      324    (7)
A_UNAL_IO                   =00F00001    129      (2)      257    (6)     #-620   (11)
A_WCS_ADDRESS                00000024-R  135      (2)
BASE_005                     00000000-R  467      (9)      477    (9)
BIT...                      =0000001A    79       (2)      58     (2)      72     (2)      73     (2)      76     (2)
                                                           77     (2)      78     (2)      79     (2)
BUFSIZ                      =00000080    127      (2)     #-290   (7)     #-315   (7)     #-319   (7)     #-324   (7)
CEP_FUNCTIONAL              =00000000    58       (2)
CEP_REPAIR                  =00000001    58       (2)      58     (2)
CLEAR_BUFFER                 00000836-R  455      (8)      535    (10)     611    (11)     686    (12)     761    (13)
CPU$V_COMET                 =00000002    73       (2)
CPU$V_HS                    =00000000    73       (2)
CPU$V_STAR                  =00000001    73       (2)
```

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ZZ-EN
ENKAX
VAX-1

Macro
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WRKD$
SYS$S
SYS$S
TOTAL

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```
DATA_005                        0000001C-R   477     (9)       477     (9)
DATA_1                          0000042C-R   235     (4)     #-541     (10)    #-617     (11)    #-692     (12)    #-767     (13)
DEFAULT                        =00000000     80      (2)       477     (9)
DS$ABORT                        00010020     74      (2)       556     (10)      558     (10)      632     (11)      634     (11)
                                                               707     (12)      709     (12)      782     (13)      784     (13)
DS$ASKADR                       00010090     74      (2)
DS$ASKDATA                      00010080     74      (2)
DS$ASKLGCL                      00010098     74      (2)
DS$ASKSTR                       000100A0     74      (2)
DS$ASKVLD                       00010088     74      (2)
DS$ATTACH                       000101A8     74      (2)
DS$BGNSUB                       00010030     74      (2)       533     (10)      609     (11)      684     (12)      759     (13)
DS$BRANCH                       000100A8     74      (2)
DS$BREAK                        00010058     74      (2)       789     (13)
DS$CANWAIT                      00010070     74      (2)
DS$CHANNEL                      00010180     74      (2)
DS$CKLOOP                       00010040     74      (2)
DS$CLRVEC                       00010168     74      (2)       549     (10)      625     (11)      700     (12)      775     (13)
                                                               788     (13)
DS$CNTRLC                       00010078     74      (2)
DS$CVTREG                       000100B0     74      (2)       315     (7)       319     (7)       324     (7)
DS$ENDPASS                      00010010     74      (2)
DS$ENDSUB                       00010038     74      (2)       560     (10)      636     (11)      711     (12)      786     (13)
DS$ERRDEV                       000100C8     74      (2)
DS$ERRHARD                      000100D0     74      (2)       554     (10)      630     (11)      705     (12)      780     (13)
DS$ERRPREP                      00010108     74      (2)
DS$ERRSOFT                      000100D8     74      (2)
DS$ERRSYS                       000100C0     74      (2)
DS$ESCAPE                       00010050     74      (2)
DS$FREEDBGSYM                   000101B8     74      (2)
DS$GETBUF                       00010120     74      (2)
DS$GETMEM                       00010130     74      (2)
DS$GPHARD                       00010018     74      (2)
DS$HELP                         000101B0     74      (2)
DS$INITSCB                      00010170     74      (2)
DS$INLOOP                       00010048     74      (2)
DS$K_ERROR                     =00000002     72      (2)
DS$K_NORMAL                    =00000001     72      (2)
DS$K_SEVERE                    =00000004     72      (2)
DS$K_SUBSYS                    =00000066     72      (2)       72      (2)
DS$K_WARNING                   =00000000     72      (2)
DS$LOAD                         00010198     74      (2)
DS$LOADPCS                      000101C0     74      (2)
DS$MAPDBGBLOCK                  00010118     74      (2)
DS$MMOFF                        00010158     74      (2)
DS$MMON                         00010150     74      (2)
DS$MOVPHY                       00010148     74      (2)
DS$MOVVRT                       00010140     74      (2)
DS$PARSE                        000100B8     74      (2)
DS$PRINTB                       000100E0     74      (2)       292     (7)       293     (7)       295     (7)       299     (7)
                                                               302     (7)       304     (7)       308     (7)       316     (7)
                                                               320     (7)       327     (7)       335     (7)       340     (7)
DS$PRINTF                       000100F0     74      (2)       481     (9)
DS$PRINTS                       000100F8     74      (2)
DS$PRINTSIG                     00010100     74      (2)       298     (7)       300     (7)
DS$PRINTX                       000100E8     74      (2)       306     (7)       310     (7)       325     (7)       337     (7)
DS$PROBE                        000101A0     74      (2)
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DS$RELBUF                        00010128      74        (2)
DS$RELMEM                        00010138      74        (2)
DS$SETIPL                        00010178      74        (2)
DS$SETMAP                        00010188      74        (2)
DS$SETPRIEXV                     00010110      74        (2)
DS$SETVEC                        00010160      74        (2)      484      (9)       536      (10)      612      (11)      687      (12)
                                                                  762      (13)
DS$SHOCHAN                       00010190      74        (2)
DS$SUMMARY                       00010028      74        (2)
DS$WAITMS                        00010060      74        (2)
DS$WAITUS                        00010068      74        (2)
DS$_ARITH                       =006600D0      72        (2)
DS$_BADLINK                     =006600F0      72        (2)
DS$_BADTYPE                     =006600E8      72        (2)
DS$_CHME                        =006600A8      72        (2)
DS$_CHMK                        =006600E0      72        (2)
DS$_DEVNAME                     =00660108      72        (2)
DS$_ERROR                       =00660002      72        (2)
DS$_FHWE                        =00660068      72        (2)
DS$_FRAGBUF                     =00660080      72        (2)
DS$_ICBUSY                      =006600C8      72        (2)
DS$_ICERR                       =006600C0      72        (2)
DS$_IHWE                        =00660060      72        (2)
DS$_ILLCHAR                     =00660018      72        (2)
DS$_ILLPAGCNT                   =00660078      72        (2)
DS$_ILLUNIT                     =00660100      72        (2)
DS$_INSFMEM                     =00660050      72        (2)
DS$_IPL2HI                      =006600B8      72        (2)
DS$_IVADDR                      =00660040      72        (2)
DS$_IVVECT                      =00660038      72        (2)
DS$_KRNLSTK                     =00660090      72        (2)
DS$_LOGIC                       =00660070      72        (2)
DS$_MCHK                        =00660088      72        (2)      244      (6)       254      (6)       264      (6)       274      (6)
DS$_MMOFF                       =00660058      72        (2)
DS$_NEEDUNIT                    =006600F8      72        (2)
DS$_NOPCS                       =00660110      72        (2)
DS$_NORMAL                      =00660001      72        (2)
DS$_NOSUPPORT                   =006600B1      72        (2)
DS$_NOTDON                      =00660030      72        (2)
DS$_NOTIMP                      =006600B0      72        (2)      72       (2)
DS$_NULLSTR                     =00660010      72        (2)
DS$_OVERFLOW                    =00660008      72        (2)
DS$_POWER                       =00660098      72        (2)
DS$_PROGERR                     =00660020      72        (2)
DS$_SEVERE                      =00660004      72        (2)
DS$_TRANSL                      =006600A0      72        (2)
DS$_TRUNCATE                    =00660028      72        (2)
DS$_UNEXPINT                    =006600D8      72        (2)
DS$_VASFULL                     =00660048      72        (2)
DS$_WARNING                     =00660000      72        (2)      72       (2)
DSA$AL_APTMAIL                   0000FE00      73        (2)
DSA$AT_APTTXT                    0000FA00      73        (2)
DSA$GL_APTCOM                    0000FE04      73        (2)
DSA$GL_DEVLEN                    0000FE58      73        (2)
DSA$GL_ERRNO                     0000FE44      73        (2)
DSA$GL_EVENT                     0000FE48      73        (2)
DSA$GL_FLAGS                     0000FE00      73        (2)
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DSA$GL_MSGTYP                    0000FE40      73       (2)
DSA$GL_PASSES                    0000FE08      73       (2)
DSA$GL_PASSNO                    0000FE54      73       (2)
DSA$GL_SECTNO                    0000FE10      73       (2)
DSA$GL_SID                       0000FE14      73       (2)
DSA$GL_SUBTNO                    0000FE4C      73       (2)
DSA$GL_TESTNO                    0000FE50      73       (2)
DSA$GL_UNITS                     0000FE0C      73       (2)
DSA$GQ_MSGPTR                    0000FE68      73       (2)
DSA$GT_DEVNAM                    0000FE5C      73       (2)
DSA$M_APT                       =80000000      73       (2)
DSA$M_BELL                      =00000008      73       (2)
DSA$M_BINARY                    =00000002      73       (2)
DSA$M_CRD_AUTOTEST              =00000800      73       (2)
DSA$M_CRD_MENUTEST              =00010000      73       (2)
DSA$M_CRD_TRACE                 =00020000      73       (2)
DSA$M_DEBUG                     =04000000      73       (2)
DSA$M_HALT                      =00000001      73       (2)
DSA$M_IE1                       =00000010      73       (2)
DSA$M_IE2                       =00000020      73       (2)
DSA$M_IE3                       =00000040      73       (2)
DSA$M_IES                       =00000080      73       (2)
DSA$M_LOAD_DEBUGGER             =40000000      73       (2)
DSA$M_LOOP                      =00000004      73       (2)
DSA$M_NORPT                     =08000000      73       (2)
DSA$M_OPER                      =00001000      73       (2)
DSA$M_PASS0                     =20000000      73       (2)
DSA$M_PROMPT                    =00002000      73       (2)
DSA$M_QA                        =00008000      73       (2)
DSA$M_QUICK                     =00000100      73       (2)
DSA$M_SEARCH                    =00004000      73       (2)
DSA$M_TRACE                     =00000400      73       (2)
DSA$M_USER                      =10000000      73       (2)
DSA$M_VERIFY                    =00000200      73       (2)
DSA$V_APT                       =0000001F      73       (2)
DSA$V_BELL                      =00000003      73       (2)
DSA$V_BINARY                    =00000001      73       (2)
DSA$V_CRD_AUTOTEST              =0000000B      73       (2)
DSA$V_CRD_MENUTEST              =00000010      73       (2)
DSA$V_CRD_TRACE                 =00000011      73       (2)
DSA$V_DEBUG                     =0000001A      73       (2)
DSA$V_HALT                      =00000000      73       (2)
DSA$V_IE1                       =00000004      73       (2)
DSA$V_IE2                       =00000005      73       (2)
DSA$V_IE3                       =00000006      73       (2)
DSA$V_IES                       =00000007      73       (2)
DSA$V_LOAD_DEBUGGER             =0000001E      73       (2)
DSA$V_LOOP                      =00000002      73       (2)
DSA$V_NORPT                     =0000001B      73       (2)
DSA$V_OPER                      =0000000C      73       (2)
DSA$V_PASS0                     =0000001D      73       (2)
DSA$V_PROMPT                    =0000000D      73       (2)
DSA$V_QA                        =0000000F      73       (2)
DSA$V_QUICK                     =00000008      73       (2)
DSA$V_SEARCH                    =0000000E      73       (2)
DSA$V_TRACE                     =0000000A      73       (2)
DSA$V_USER                      =0000001C      73       (2)
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                                                            G 12
ZZ-ENKAX-1.3      Cross reference                        3-AUG-1983          Fiche 2  Frame G12          Sequence 355
ENKAXF                            VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:46:48  VAX-11 Macro V03-00         Page  35
Cross reference                                                            3-AUG-1983 09:59:33  WRKD$0:[PAN.ENKAX]ENKAXF.MAR;72  (13)

DSA$V_VERIFY                   =00000009      73     (2)
ENV$M_DOMAIN                   =00000002      58     (2)
ENV$M_LEVEL                    =00000001      58     (2)
ENV$M_SUPER                    =000003FC      58     (2)
ENV$S_DOMAIN                   =00000001      58     (2)
ENV$S_LEVEL                    =00000001      58     (2)
ENV$S_SUPER                    =00000008      58     (2)
ENV$V_DOMAIN                   =00000001      58     (2)      58     (2)
ENV$V_LEVEL                    =00000000      58     (2)      58     (2)
ENV$V_SUPER                    =00000002      58     (2)
ENV$_CPU                       =00000000      58     (2)      58     (2)
ENV$_FUNCTIONAL                =00000000      58     (2)      58     (2)
ENV$_REPAIR                    =00000001      58     (2)      58     (2)
ENV$_SUPER                     =00000001      58     (2)
ENV$_SYSTEM                    =00000001      58     (2)      58     (2)
ERR$_MSGADR                    =0000000C      75     (2)
ERR$_NARGS                     =0000000A      75     (2)
ERR$_NUM                       =00000004      75     (2)
ERR$_P1                        =00000014      75     (2)      293    (7)
ERR$_P2                        =00000018      75     (2)      300    (7)
ERR$_P3                        =0000001C      75     (2)
ERR$_P4                        =00000020      75     (2)
ERR$_P5                        =00000024      75     (2)
ERR$_P6                        =00000028      75     (2)
ERR$_POINTER                   =00000010      75     (2)
ERR$_UNIT                      =00000008      75     (2)
ERROR_CHECK                     00000744-R    399    (8)      552    (10)     628    (11)     703    (12)     778    (13)
ERR_MESSAGE                     000004B0-R    288    (7)      554    (10)     630    (11)     705    (12)     780    (13)
GPR_TABLE                       00000000-XR                   328    (7)      352    (8)      403    (8)
HALT                           =00000004      80     (2)
HP$A_DEPENDENT                  00000032      78     (2)      79     (2)
HP$A_DEVICE                     00000018      78     (2)
HP$A_DVA                        0000001C      78     (2)
HP$A_LINK                       00000020      78     (2)
HP$B_DRIVE                      0000000B      78     (2)
HP$B_FLAGS                      0000000A      78     (2)
HP$M_ALLOC                     =00000001      78     (2)
HP$M_WASALL                    =00000002      78     (2)
HP$Q_DEVICE                     00000000      78     (2)
HP$T_DEVICE                     0000000C      78     (2)
HP$T_TYPE                       00000026      78     (2)
HP$V_ALLOC                     =00000000      78     (2)
HP$V_WASALL                    =00000001      78     (2)
HP$W_SIZE                       00000008      78     (2)
HP$W_VECTOR                     00000024      78     (2)
IPR                            =00000006      80     (2)
KA$B_ACC_TYPE                   00000042      79     (2)
KA$B_RESERVED                   00000043      79     (2)
KA$B_SID_TYPE                   0000003D      79     (2)
KA$K_LEN                        00000046      79     (2)
KA$L_FLAGS                      00000032      79     (2)
KA$L_SID                        0000003A      79     (2)
KA$M_CHAR                      =00000100      79     (2)
KA$M_CRC                       =00000010      79     (2)
KA$M_D_FLOAT                   =00000002      79     (2)
KA$M_EDIT                      =00000080      79     (2)
KA$M_F_FLOAT                   =00000001      79     (2)
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                                                                          H 12
ZZ-ENKAX-1.3     Cross reference                                       3-AUG-1983        Fiche 2  Frame H12         Sequence 356
ENKAXF                               VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:46:48  VAX-11 Macro V03-00            Page  36
Cross reference                                                        3-AUG-1983 09:59:33  WRKD$0:[PAN.ENKAX]ENKAXF.MAR;72  (13)

KA$M_G_FLOAT                     =00000004     79       (2)
KA$M_H_FLOAT                     =00000008     79       (2)
KA$M_PACKED                      =00000020     79       (2)
KA$M_PACK_MUL                    =00000040     79       (2)
KA$M_SB_ERR                      =02000000     79       (2)
KA$M_TODR                        =00010000     79       (2)
KA$M_WCS_LD                      =01000000     79       (2)
KA$V_CHAR                        =00000008     79       (2)
KA$V_CRC                         =00000004     79       (2)
KA$V_D_FLOAT                     =00000001     79       (2)
KA$V_EDIT                        =00000007     79       (2)
KA$V_F_FLOAT                     =00000000     79       (2)
KA$V_G_FLOAT                     =00000002     79       (2)
KA$V_H_FLOAT                     =00000003     79       (2)
KA$V_PACKED                      =00000005     79       (2)
KA$V_PACK_MUL                    =00000006     79       (2)
KA$V_SB_ERR                      =00000019     79       (2)
KA$V_TODR                        =00000010     79       (2)
KA$V_WCS_LD                      =00000018     79       (2)
KA$W_LATENCY                      0000003E     79       (2)
KA$W_MEM_SIZE                     00000044     79       (2)
KA$W_PROGRESS                     00000040     79       (2)
KA$W_RESERVED                     00000038     79       (2)
KA$W_WCS                          00000036     79       (2)
KA_PTABLE                         00000000-XR                  #-479   (9)
KA_UNIT_NO                        00000000-XR                  #-554   (10)    #-630   (11)    #-705   (12)    #-780   (13)
LDPCTX                           =0000000B     80       (2)
LOAD_GPR                          000006C3-R   351      (8)      542   (10)      618   (11)      693   (12)      768   (13)
L_ACT_ISP                         00000000-XR                  #-306   (7)     #-382   (8)     #-419   (8)
L_ACT_PSL                         00000000-XR                  #-319   (7)     #-320   (7)     #-383   (8)     #-422   (8)
                                                                 427   (8)       432   (8)
L_ACT_SP                          00000000-XR                  #-308   (7)     #-310   (7)     #-381   (8)     #-416   (8)
L_ADDRESS                         00000004-R   88       (2)
L_COUNT                           00000000-R   87       (2)    #-457   (8)     #-459   (8)
L_CUR_ISP                         00000008-R   89       (2)
L_DATA                           =00000000     132      (2)
L_EXP_AP                          00000000-XR                  #-359   (8)
L_EXP_FP                          00000000-XR                  #-360   (8)
L_EXP_ISP                         00000000-XR                  #-306   (7)     #-419   (8)     #-540   (10)    #-616   (11)
                                                               #-691   (12)    #-766   (13)
L_EXP_MOD                         00000010-R   91       (2)    #-425   (8)     #-427   (8)
L_EXP_PSL                         00000000-XR                  #-315   (7)     #-316   (7)     #-324   (7)     #-325   (7)
                                                               #-422   (8)       425   (8)       430   (8)     #-541   (10)
                                                               #-617   (11)    #-692   (12)    #-767   (13)
L_EXP_SP                          00000000-XR                  #-308   (7)     #-416   (8)     #-539   (10)    #-615   (11)
                                                               #-690   (12)    #-765   (13)
L_EXP_STACK                       00000014-R   92       (2)    #-430   (8)     #-432   (8)
L_FLAGS                           00000020-R   96       (2)      294   (7)       301   (7)       303   (7)       305   (7)
                                                                 307   (7)       311   (7)       326   (7)       339   (7)
                                                               #-406   (8)       408   (8)     #-414   (8)     #-418   (8)
                                                               #-421   (8)     #-434   (8)     #-435   (8)       436   (8)
                                                               #-437   (8)       438   (8)     #-439   (8)       440   (8)
                                                               #-441   (8)     #-449   (8)     #-538   (10)    #-543   (10)
                                                               #-546   (10)      553   (10)      557   (10)    #-614   (11)
                                                               #-619   (11)    #-622   (11)      629   (11)      633   (11)
                                                               #-689   (12)    #-694   (12)    #-697   (12)      704   (12)
                                                                 708   (12)    #-764   (13)    #-769   (13)    #-772   (13)
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                                                                  I 12
ZZ-ENKAX-1.3    Cross reference                               3-AUG-1983          Fiche 2  Frame I12         Sequence 357
ENKAXF                            VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:46:48  VAX-11 Macro V03-00           Page  37
Cross reference                                                        3-AUG-1983 09:59:33  WRKD$0:[PAN.ENKAX]ENKAXF.MAR;72  (13)

                                                           779     (13)      783    (13)
L_KSP                           00000000-XR                #-485   (9)
L_TIMER                         0000001C-R     94    (2)
MANUAL                         =00000001       80    (2)
MCHK                           =00000005       80    (2)     477     (9)
MEM                            =00000009       80    (2)
MODELIST                        00000000-XR                315     (7)       319    (7)       324    (7)
MSG_005                         00000002-R     467   (9)     477     (9)
M_BIT19                        =00080000       125   (2)
M_BIT20                        =00100000       126   (2)
M_DONE                         =00000002       101   (2)
M_ERROR_FLAG                   =00000080       113   (2)     #-406   (8)       #-414  (8)       #-418  (8)       #-421  (8)
                                                           #-435   (8)       #-437  (8)       #-439  (8)       #-441  (8)
M_EXECUTE_ERR                  =00000004       103   (2)     #-546   (10)      #-622  (11)      #-697  (12)      #-772  (13)
M_FATAL_ERR                    =00000010       107   (2)     #-434   (8)
M_GPR_ERR                      =00000040       111   (2)     #-406   (8)
M_INT                          =00002000       121   (2)
M_ISP_ERR                      =00000200       115   (2)     #-421   (8)
M_MCINT                        =00004000       123   (2)
M_MC_ERR                       =00001000       119   (2)     #-414   (8)
M_PSL_ERR                      =00000020       109   (2)     #-435   (8)
M_READY                        =00000001       99    (2)     #-543   (10)      #-619  (11)      #-694  (12)      #-769  (13)
M_SP_ERR                       =00000400       117   (2)     #-418   (8)
M_TIMER                        =00000008       105   (2)     #-449   (8)
PAR$M_ATDEF                    =00000010       76    (2)
PAR$M_ATHI                     =00000008       76    (2)
PAR$M_ATLO                     =00000004       76    (2)
PAR$M_NODEF                    =00000002       76    (2)
PAR$V_ATDEF                    =00000004       76    (2)
PAR$V_ATHI                     =00000003       76    (2)
PAR$V_ATLO                     =00000002       76    (2)
PAR$V_NODEF                    =00000001       76    (2)
PAR$_BIN                       =00000002       76    (2)
PAR$_DEC                       =0000000A       76    (2)
PAR$_HEX                       =00000010       76    (2)
PAR$_NO                        =00000000       76    (2)
PAR$_OCT                       =00000008       76    (2)
PAR$_YES                       =00000001       76    (2)
POWER                          =00000003       80    (2)
PR$_ISP                         00000000-XR                #-382   (8)       #-540  (10)      #-616  (11)      #-691  (12)
                                                           #-766   (13)
PR$_MCESR                       00000000-XR                #-370   (8)       #-534  (10)      #-610  (11)      #-685  (12)
                                                           #-760   (13)
PSL$C_EXEC                     =00000001       77    (2)
PSL$C_KERNEL                   =00000000       77    (2)
PSL$C_SUPER                    =00000002       77    (2)
PSL$C_USER                     =00000003       77    (2)
PSL$K_EXEC                     =00000001       77    (2)
PSL$K_KERNEL                   =00000000       77    (2)
PSL$K_SUPER                    =00000002       77    (2)
PSL$K_USER                     =00000003       77    (2)
PSL$M_C                        =00000001       77    (2)
PSL$M_CBIT                     =00000001       77    (2)
PSL$M_CM                       =80000000       77    (2)     77      (2)
PSL$M_CURMOD                   =03000000       77    (2)
PSL$M_DV                       =00000080       77    (2)
PSL$M_FPD                      =08000000       77    (2)     77      (2)
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SYM
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$$S
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ENV
ENV
ENV
ENV
ENV
ENV
SEP
SEP
SIZ
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PSL$M_FU                       =00000040     77     (2)
PSL$M_IPL                      =001F0000     77     (2)
PSL$M_IS                       =04000000     77     (2)
PSL$M_IV                       =00000020     77     (2)
PSL$M_N                        =00000008     77     (2)
PSL$M_NBIT                     =00000008     77     (2)
PSL$M_PRVMOD                   =00C00000     77     (2)
PSL$M_SAFBITS                  =000037FF     77     (2)
PSL$M_TBIT                     =00000010     77     (2)
PSL$M_TP                       =40000000     77     (2)       77     (2)
PSL$M_V                        =00000002     77     (2)
PSL$M_VBIT                     =00000002     77     (2)
PSL$M_Z                        =00000004     77     (2)
PSL$M_ZBIT                     =00000004     77     (2)
PSL$S_CURMOD                   =00000002     77     (2)    #-424     (8)    #-426     (8)
PSL$S_IPL                      =00000005     77     (2)
PSL$S_PRVMOD                   =00000002     77     (2)
PSL$V_C                        =00000000     77     (2)
PSL$V_CBIT                     =00000000     77     (2)
PSL$V_CM                       =0000001F     77     (2)
PSL$V_CURMOD                   =00000018     77     (2)    #-424     (8)    #-426     (8)
PSL$V_DV                       =00000007     77     (2)
PSL$V_FPD                      =0000001B     77     (2)
PSL$V_FU                       =00000006     77     (2)
PSL$V_IPL                      =00000010     77     (2)
PSL$V_IS                       =0000001A     77     (2)    #-429     (8)    #-431     (8)
PSL$V_IV                       =00000005     77     (2)
PSL$V_N                        =00000003     77     (2)
PSL$V_NBIT                     =00000003     77     (2)
PSL$V_PRVMOD                   =00000016     77     (2)
PSL$V_TBIT                     =00000004     77     (2)
PSL$V_TP                       =0000001E     77     (2)
PSL$V_V                        =00000001     77     (2)
PSL$V_VBIT                     =00000001     77     (2)
PSL$V_Z                        =00000002     77     (2)
PSL$V_ZBIT                     =00000002     77     (2)
READ_GPR                        000006EC-R   369    (8)      536     (10)     612     (11)     687     (12)     762     (13)
REG_TABLE                       00000000-XR                  332     (7)
RENTRY1                         000000CD-R   548    (10)   #-537     (10)
RENTRY2                         000001AC-R   624    (11)   #-613     (11)
RENTRY3                         0000028B-R   699    (12)   #-688     (12)
RENTRY4                         0000036A-R   774    (13)   #-763     (13)
RENTRY_POINT                    0000000C-R   90     (2)      389     (8)    #-537     (10)   #-613     (11)   #-688     (12)
                                                           #-763     (13)
SCB$L_ACCESS                    00000020     71     (2)
SCB$L_ARITH                     00000034     71     (2)
SCB$L_BREAK                     0000002C     71     (2)
SCB$L_CHME                      00000044     71     (2)
SCB$L_CHMK                      00000040     71     (2)
SCB$L_CHMS                      00000048     71     (2)
SCB$L_CHMU                      0000004C     71     (2)
SCB$L_COMPAT                    00000030     71     (2)
SCB$L_KNLSTK                    00000008     71     (2)
SCB$L_MACHCHK                   00000004     71     (2)    #-536     (10)   #-549     (10)   #-612     (11)   #-625     (11)
                                                           #-687     (12)   #-700     (12)   #-762     (13)   #-775     (13)
SCB$L_OPCCUS                    00000014     71     (2)
SCB$L_OPCDEC                    00000010     71     (2)
```

```
SCB$L_POWER                      0000000C     71     (2)
SCB$L_RADRMOD                    0000001C     71     (2)
SCB$L_ROPRAND                    00000018     71     (2)
SCB$L_RXDB                       000000F8     71     (2)
SCB$L_SFTLVL1                    00000084     71     (2)
SCB$L_SFTLVL10                   000000A8     71     (2)
SCB$L_SFTLVL11                   000000AC     71     (2)
SCB$L_SFTLVL12                   000000B0     71     (2)
SCB$L_SFTLVL13                   000000B4     71     (2)
SCB$L_SFTLVL14                   000000B8     71     (2)
SCB$L_SFTLVL15                   000000BC     71     (2)
SCB$L_SFTLVL2                    00000088     71     (2)
SCB$L_SFTLVL3                    0000008C     71     (2)
SCB$L_SFTLVL4                    00000090     71     (2)
SCB$L_SFTLVL5                    00000094     71     (2)
SCB$L_SFTLVL6                    00000098     71     (2)
SCB$L_SFTLVL7                    0000009C     71     (2)
SCB$L_SFTLVL8                    000000A0     71     (2)
SCB$L_SFTLVL9                    000000A4     71     (2)
SCB$L_TBIT                       00000028     71     (2)
SCB$L_TIMER                      000000C0     71     (2)    #-484     (9)    #-788     (13)
SCB$L_TRANSL                     00000024     71     (2)
SCB$L_TXDB                       000000FC     71     (2)
SCB$L_ZERO                       00000000     71     (2)
SEP_FUNCTIONAL                  =00000002     58     (2)
SEP_REPAIR                      =00000003     58     (2)
SIZ...                          =00000001     79     (2)      58     (2)      73     (2)      76     (2)      77     (2)
                                                                78     (2)      79     (2)
SYS$ALLOC                        00010238     74     (2)
SYS$ASCTIM                       00010248     74     (2)
SYS$ASSIGN                       00010250     74     (2)
SYS$BINTIM                       00010258     74     (2)
SYS$CANCEL                       00010260     74     (2)
SYS$CANTIM                       00010268     74     (2)
SYS$CLOSE                        000105B8     74     (2)
SYS$CLREF                        00010298     74     (2)
SYS$CONNECT                      000105C0     74     (2)
SYS$DALLOC                       000102D8     74     (2)
SYS$DASSGN                       000102E0     74     (2)
SYS$DISCONNECT                   000105D0     74     (2)
SYS$FAO                          00010350     74     (2)
SYS$FAOL                         00010358     74     (2)
SYS$GET                          00010580     74     (2)
SYS$GETCHN                       000104C8     74     (2)
SYS$GETTIM                       00010378     74     (2)
SYS$LKWSET                       000103A0     74     (2)
SYS$NUMTIM                       000103B8     74     (2)
SYS$OPEN                         00010608     74     (2)
SYS$QIO                          000103C8     74     (2)
SYS$QIOW                         00010200     74     (2)
SYS$READ                         00010590     74     (2)
SYS$READEF                       000103D0     74     (2)
SYS$SETAST                       000103F8     74     (2)
SYS$SETEF                        00010400     74     (2)
SYS$SETIMR                       00010420     74     (2)
SYS$SETPRI                       00010428     74     (2)
SYS$SETPRT                       00010430     74     (2)
```

```
SYS$SETRWM                      00010438     74     (2)
SYS$SETSWM                      00010448     74     (2)
SYS$ULKPAG                      00010460     74     (2)
SYS$ULWSET                      00010468     74     (2)
SYS$UNWIND                      00010470     74     (2)
SYS$WAITFR                      00010478     74     (2)
SYS$WFLAND                      00010488     74     (2)
SYS$WFLOR                       00010490     74     (2)
T5_S1                           00000056-R   533    (10)
T5_S1_X                         0000012A-R   560    (10)
T5_S2                           00000135-R   609    (11)
T5_S2_X                         00000209-R   636    (11)
T5_S3                           00000214-R   684    (12)
T5_S3_X                         000002E8-R   711    (12)
T5_S4                           000002F3-R   759    (13)
T5_S4_X                         000003C7-R   786    (13)
TABLE1                          00000430-R   243    (6)     #-297     (7)     #-551     (10)    #-554     (10)
TABLE2                          00000450-R   253    (6)     #-627     (11)    #-630     (11)
TABLE3                          00000470-R   263    (6)     #-702     (12)    #-705     (12)
TABLE4                          00000490-R   273    (6)     #-777     (13)    #-780     (13)
TAG_1                           000000BB-R   544    (10)      249     (6)
TAG_2                           0000019A-R   620    (11)      259     (6)
TAG_3                           00000279-R   695    (12)      269     (6)
TAG_4                           00000358-R   770    (13)      279     (6)
TEST_005                        00000020-R   477    (9)       477     (9)
TEST_005_X                      000003E2-R   789    (13)    #-482     (9)
TIMER_SERVICE                   00000830-R   448    (8)       484     (9)
TU58                           =00000002     80     (2)
T_ACT_PSL                       00000364-R   209    (3)       320     (7)
T_BAD_DATA                      000002B2-R   194    (3)
T_BUSERR                        00000089-R   151    (3)     #-554     (10)
T_EXECUTE                       000001D2-R   176    (3)       304     (7)
T_EXPECTED                      0000015E-R   167    (3)       299     (7)
T_EXP_PSL                       00000343-R   206    (3)       316     (7)
T_GOOD_DATA                     000002DB-R   197    (3)
T_GPR                           0000039C-R   215    (3)       327     (7)
T_GPR_ERR                       00000289-R   191    (3)
T_ILLIO_ERR                     000000DE-R   157    (3)     #-705     (12)
T_ILLUB_ERR                     00000104-R   160    (3)     #-780     (13)
T_ISP_ERR                       0000021F-R   182    (3)       306     (7)
T_MC_ERR                        0000012D-R   163    (3)       295     (7)
T_MC_MESS                       00000060-R   148    (3)       292     (7)
T_NOT_ON_IS                     0000031C-R   203    (3)
T_NOT_ON_KS                     000002F8-R   200    (3)
T_NOT_READY                     000001A0-R   173    (3)       302     (7)
T_NOXOR                         000003E0-R   221    (3)       337     (7)
T_NO_KA730                      00000028-R   145    (3)       481     (9)
T_NO_WCS                        000003F6-R   224    (3)
T_PSL                           00000383-R   212    (3)       325     (7)
T_SP_ERR1                       00000253-R   185    (3)       308     (7)
T_SP_ERR2                       0000027D-R   188    (3)       310     (7)
T_TIMER                         000001F7-R   179    (3)       340     (7)
T_UNALIO_ERR                    000000B6-R   154    (3)     #-630     (11)
T_UNEXP_DATA                    0000016B-R   170    (3)
T_XOR                           000003C4-R   218    (3)       335     (7)
UBI                            =0000000A     80     (2)
V_DONE                         =00000001     100    (2)
```

```
V_ERROR_FLAG                    =00000007     112    (2)     #-553    (10)    #-629    (11)    #-704    (12)    #-779    (13)
V_EXECUTE_ERR                   =00000002     102    (2)     #-303    (7)     #-438    (8)
V_FATAL_ERR                     =00000004     106    (2)     #-557    (10)    #-633    (11)    #-708    (12)    #-783    (13)
V_GPR_ERR                       =00000006     110    (2)     #-326    (7)
V_INT                           =0000000D     120    (2)     #-408    (8)
V_ISP_ERR                       =00000009     114    (2)     #-305    (7)
V_MCINT                         =0000000E     122    (2)
V_MC_ERR                        =0000000C     118    (2)     #-294    (7)
V_PSL_ERR                       =00000005     108    (2)     #-311    (7)
V_READY                         =00000000     98     (2)     #-301    (7)     #-436    (8)
V_SP_ERR                        =0000000A     116    (2)     #-307    (7)
V_TIMER                         =00000003     104    (2)     #-339    (7)     #-440    (8)
WCS                             =00000007     80     (2)
```

```
                                                                      N 12
ZZ-ENKAX-1.3      Cross reference                                  3-AUG-1983         Fiche 2  Frame N12          Sequence 362
ENKAXF                               VAX-11/730 Specific CPU Cluster Exercise   3-AUG-1983 13:46:48   VAX-11 Macro V03-00          Page  42
Cross reference                                                                 3-AUG-1983 09:59:33   WRKD$0:[PAN.ENKAX]ENKAXF.MAR;72   (13)


                                          +--------------------------+
                                          ! Macros Cross Reference  !
                                          +--------------------------+
MACRO             SIZE        DEFINITION    REFERENCES...
-----             ----        ----------    -------------
$D1_ABPROGRAM     1           556    (10)   556    (10)   558    (10)   632    (11)   634    (11)   707    (12)
                                            709    (12)   782    (13)   784    (13)
$D1_BSUBT         1           533    (10)   533    (10)   609    (11)   684    (12)   759    (13)
$D1_BTEST         1           477    (9)    477    (9)
$D1_ERR           1           554    (10)   554    (10)   630    (11)   705    (12)   780    (13)
$D1_ERR_S         1           554    (10)   554    (10)   630    (11)   705    (12)   780    (13)
$D1_ESUBT         1           560    (10)   560    (10)   636    (11)   711    (12)   786    (13)
$D1_ETEST         1           789    (13)   789    (13)
$D1_EXTEST        1           482    (9)    482    (9)
$D1_PRINT_S       1           292    (7)    292    (7)    293    (7)    295    (7)    299    (7)    302    (7)
                                            304    (7)    306    (7)    308    (7)    310    (7)    316    (7)
                                            320    (7)    325    (7)    327    (7)    335    (7)    337    (7)
                                            340    (7)    481    (9)
$D1_SBTTL         2           467    (9)    467    (9)    488    (10)   564    (11)   639    (12)   714    (13)
$D2_BDATA         1           477    (9)    477    (9)
$D2_BTEST         1           477    (9)    477    (9)
$D2_SBTTL         1           467    (9)    467    (9)
$DEF              1           79     (2)    71     (2)    73     (2)    74     (2)    78     (2)    79     (2)
$DEFEND           1           71     (2)    71     (2)    73     (2)    74     (2)    77     (2)    78     (2)
                                            79     (2)
$DEFINI           1           71     (2)    71     (2)    73     (2)    74     (2)    77     (2)    78     (2)
                                            79     (2)
$DS_ABORT         1           556    (10)   556    (10)   558    (10)   632    (11)   634    (11)   707    (12)
                                            709    (12)   782    (13)   784    (13)
$DS_BCOMPLETE     1           555    (10)   555    (10)   631    (11)   706    (12)   781    (13)
$DS_BGNMESSAGE    1           289    (7)    289    (7)
$DS_BGNMOD        1           58     (2)    58     (2)
$DS_BGNSUB        1           533    (10)   533    (10)   609    (11)   684    (12)   759    (13)
$DS_BGNTEST       1           477    (9)    477    (9)
$DS_BREAK         1           789    (13)   789    (13)
$DS_CLRVEC_S      1           549    (10)   549    (10)   625    (11)   700    (12)   775    (13)   788    (13)
$DS_CVTREG_S      1           313    (7)    313    (7)    317    (7)    322    (7)
$DS_DSADEF        1           73     (2)    73     (2)
$DS_DSBDEF        1           73     (2)
$DS_DSDEF         2           72     (2)    72     (2)
$DS_DSSDEF        1           74     (2)    74     (2)
$DS_ENDDATA       1           477    (9)    477    (9)
$DS_ENDMESSAGE    1           341    (7)    341    (7)
$DS_ENDMOD        1           790    (13)   790    (13)
$DS_ENDSUB        1           560    (10)   560    (10)   636    (11)   711    (12)   786    (13)
$DS_ENDTEST       1           789    (13)   789    (13)
$DS_ENVDEF        2           58     (2)    58     (2)
$DS_ERRDEF        1           75     (2)    75     (2)
$DS_ERRHARD_S     1           554    (10)   554    (10)   630    (11)   705    (12)   780    (13)
$DS_EXIT          1           482    (9)    482    (9)
$DS_HPODEF        2           78     (2)    78     (2)
$DS_KA_DEF        3           79     (2)    79     (2)
$DS_PAGE          1           465    (8)    465    (8)    486    (9)    562    (10)   637    (11)   712    (12)
$DS_PARDEF        1           76     (2)    76     (2)
$DS_PRINTB_S      1           292    (7)    292    (7)    293    (7)    295    (7)    299    (7)    302    (7)
```

```
                                      304    (7)     308    (7)     316    (7)     320    (7)     327    (7)
                                      335    (7)     340    (7)
$DS_PRINTF_S        1     481   (9)   481    (9)
$DS_PRINTSIG_G      1     298   (7)   298    (7)     300    (7)
$DS_PRINTX_S        1     306   (7)   306    (7)     310    (7)     325    (7)     337    (7)
$DS_PSLDEF          1     77    (2)   77     (2)
$DS_SBTTL           1     467   (9)   467    (9)     488    (10)    564    (11)    639    (12)    714    (13)
$DS_SCBDEF          1     71    (2)   71     (2)
$DS_SECDEF          1     80    (2)   80     (2)
$DS_SETVEC_S        1     484   (9)   484    (9)     536    (10)    612    (11)    687    (12)    762    (13)
$EQU                1     79    (2)   58     (2)     72     (2)     76     (2)     77     (2)
$EQULS1             1     77    (2)   58     (2)     72     (2)     77     (2)
$EQULST             1     58    (2)   58     (2)     72     (2)     77     (2)
$GBLINI             2     58    (2)   58     (2)     71     (2)     72     (2)     73     (2)     74     (2)
                                      76     (2)     77     (2)     78     (2)     79     (2)
$HP_DEFDEF          1     78    (2)
$KADEF              1     79    (2)
$OFFDEF             1     75    (2)   75     (2)
$PSLDEF             1     77    (2)   77     (2)
$PUSHADR            1     315   (7)   315    (7)     319    (7)     324    (7)     554    (10)    630    (11)
                                      705    (12)    780    (13)
$VIELD              1     58    (2)   58     (2)     73     (2)     76     (2)     77     (2)     78     (2)
                                      79     (2)
$VIELD1             1     79    (2)   58     (2)     73     (2)     76     (2)     77     (2)     78     (2)
                                      79     (2)
ENKAX_SECDEF        1     80    (2)   80     (2)

                                                        +--------------------------+
                                                        ! Performance indicators !
                                                        +--------------------------+

Phase                        Page faults    CPU Time         Elapsed Time
-----                        -----------    --------         ------------
Initialization                        24    00:00:00.05      00:00:00.22
Command processing                    25    00:00:00.23      00:00:00.65
Pass 1                              1130    00:00:17.61      00:00:45.16
Symbol table sort                      0    00:00:00.81      00:00:02.34
Pass 2                               351    00:00:03.79      00:00:07.21
Symbol table output                   75    00:00:00.42      00:00:00.69
Psect synopsis output                  7    00:00:00.04      00:00:00.05
Cross-reference output               216    00:00:02.59      00:00:06.17
Assembler run totals                1832    00:00:25.55      00:01:02.49

The working set limit was 1000 pages.
142491 bytes (279 pages) of virtual memory were used to buffer the intermediate code.
There were 30 pages of symbol table space allocated to hold 530 non-local and 47 local symbols.
791 source lines were read in Pass 1, producing 32 object records in Pass 2.
125 pages of virtual memory were used to define 56 macros.
```

```
ZZ-E
ENKA
1-3

FFFF
FFFF
FFFF
```

```
                                             +---------------------------+
                                             ! Macro library statistics  !
                                             +---------------------------+
Macro library name                            Macros defined
-------------------                           --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                            1
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                         47
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                         8
TOTALS (all libraries)                                   56

866 GETS were required to define 56 macros.

There were no errors, warnings or information messages.

/LIS/CRO ENKAXF
```

```
    (1)        1          ENKAXG: TU58 EXERCISER
    (2)       60          DECLARATIONS
```

```
0000            .SBTTL  ENKAXG: TU58 EXERCISER
0000            .TITLE  ENKAXG  VAX-11/730 Specific CPU Cluster Exerciser
0000            .IDENT  /1-3/
0000
0000    ;
0000    ; Copyright (C) 1981
0000    ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000    ;
0000    ; This software is furnished  under a license for use only on a single
0000    ; computer  system and  may be  copied only with  the inclusion of the
0000    ; above copyright notice.  This software, or any other copies thereof,
0000    ; may not be provided or  otherwise made available to any other person
0000    ; except for use on such system and to one who agrees to these license
0000    ; terms.  Title to and  ownership of the  software  shall at all times
0000    ; remain in DEC.
0000    ;
0000    ; The information in this software is subject to change without notice
0000    ; and should  not be construed  as a commitment  by Digital  Equipment
0000    ; Corporation.
0000    ;
0000    ; DEC assumes  no  responsibility  for  the use or  reliability of its
0000    ; software on equipment which is not supplied by DEC.
0000    ;
0000
0000    ;++
0000    ; Facility:       VAX Architecture Diagnostic.
0000    ;
0000    ; Abstract:       This module exercises the TU58 tape controller to assure
0000    ;                 basic functionality. A series of subtests, including the
0000    ;                 controller's self test are executed checking initialize,
0000    ;                 no operation, write, read, seek, write modified, read
0000    ;                 modified, head switching and positioning. This test will
0000    ;                 be modified when a decision is made whether to implement
0000    ;                 the TU58 control microcode in silo or handshake mode.
0000    ;
0000    ;
0000    ; Environment:   VAX Diagnostic Supervisor.
0000    ;
0000    ; Author:         Rich Lewis      22-Oct-81        Version 2-X
0000    ;
0000    ;
0000    ;                 Tai-Chun Pan    01-Apr-83        Version 1.2
0000    ;                 Peter Green
0000    ;
0000    ;                 Added quick flag on Test 7(TU58). If quick flag is set
0000    ;                 will skip subtest 4 through subtest 11.  Added event flag 3.
0000    ;                 If event flag 3 is set, will override protection,
0000    ;                 i.e., go ahead and write on tape.  If run APT & event flag 3
0000    ;                 is clear & tape is not scratch, will report an error.
0000    ;                 Modified Unibus sizer on Test 8 & 9. make test run faster.
0000    ;
0000    ;
0000    ;                 Tai-Chun Pan    03-Aug-83        Version 1.3
0000    ;
0000    ;                 fixed bugs on TEST 7 and error summary routine call when
0000    ;                 running under APT.
0000    ;
```

```
                        0000     58 ;--
```

```
                              0000     60 .SBTTL  DECLARATIONS
                              0000     61         .LIST   MEB
                              0000     62         .NLIST  CND
                          00000000     63         .PSECT  ENKAXG, PAGE, NOWRT
                              0000     64         .LIBRARY         "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                              0000     65         $DS_BGNMOD       CEP_REPAIR, TN=6
                              0000        ;;;     Macro-32 Diagnostic macro library Version 6.10 'DIAG.MLB (137)"
                              0000     66
                              0000     67 ;
                              0000     68 ; Include files:
                              0000     69 ;
                              0000     70
                              0000     71         .LIBRARY         "ENKAX"         ; CPU Cluster Exerciser library.
%MACRO-E-MLBOPNERR, Error opening macro library     !
                              0000
```

```
                                                                    H 13
ZZ-ENKAX-1.3    Symbol table                                      4-AUG-1983        Fiche 2  Frame H13        Sequence 369
ENKAXG                            VAX-11/730 Specific CPU Cluster Exercise  4-AUG-1983 10:58:42  VAX-11 Macro V03-00        Page   4
Symbol table                                                              4-AUG-1983 10:34:19  WRKD$0:[PAN.ENKAX]ENKAXG.MAR;93   (2)

$$S              = FFFFFFFF
$ENV             = 00000001  G
$ER              = 00000001
$MO              = 00000000  G
$ST              = 00000000
$TN              = 00000006
BIT...           = 00000002
CEP_FUNCTIONAL   = 00000000
CEP_REPAIR       = 00000001
ENV$M_DOMAIN     = 00000002
ENV$M_LEVEL      = 00000001
ENV$M_SUPER      = 000003FC
ENV$S_DOMAIN     = 00000001
ENV$S_LEVEL      = 00000001
ENV$S_SUPER      = 00000008
ENV$V_DOMAIN     = 00000001
ENV$V_LEVEL      = 00000000
ENV$V_SUPER      = 00000002
ENV$_CPU         = 00000000
ENV$_FUNCTIONAL  = 00000000
ENV$_REPAIR      = 00000001
ENV$_SUPER       = 00000001
ENV$_SYSTEM      = 00000001
SEP_FUNCTIONAL   = 00000002
SEP_REPAIR       = 00000003
SIZ...           = 00000008

                                               +----------------+
                                               ! Psect synopsis !
                                               +----------------+

PSECT name                       Allocation          PSECT No.  Attributes
----------                       ----------          ---------  ----------
.  ABS  .                        00000000  (     0.)  00 (   0.)  NOPIC    USR    CON    ABS     LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
. BLANK .                        00000000  (     0.)  01 (   1.)  NOPIC    USR    CON    REL     LCL NOSHR   EXE   RD     WRT NOVEC BYTE
ENKAXG                           00000000  (     0.)  02 (   2.)  NOPIC    USR    CON    REL     LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
```

```
ZZ
EN
1-

69
6C
69

65
69

20
65
20

20
78

6C
6C
69

20
42

20
42
20

20
42
65
```

```
                                             +-------------------------+
                                             ! Symbol Cross Reference !
                                             +-------------------------+
SYMBOL              VALUE           DEFINITION          REFERENCES...
------              -----           ----------          -------------
$$S                =FFFFFFFF        65        (2)
$ENV               =00000001        65        (2)
$ER                =00000001        65        (2)
$MO                =00000000        65        (2)
$ST                =00000000        65        (2)
$TN                =00000006        65        (2)
BIT...             =00000002        65        (2)       65      (2)
CEP_FUNCTIONAL     =00000000        65        (2)
CEP_REPAIR         =00000001        65        (2)       65      (2)
ENV$M_DOMAIN       =00000002        65        (2)
ENV$M_LEVEL        =00000001        65        (2)
ENV$M_SUPER        =000003FC        65        (2)
ENV$S_DOMAIN       =00000001        65        (2)
ENV$S_LEVEL        =00000001        65        (2)
ENV$S_SUPER        =00000008        65        (2)
ENV$V_DOMAIN       =00000001        65        (2)       65      (2)
ENV$V_LEVEL        =00000000        65        (2)       65      (2)
ENV$V_SUPER        =00000002        65        (2)
ENV$_CPU           =00000000        65        (2)       65      (2)
ENV$_FUNCTIONAL=00000000            65        (2)       65      (2)
ENV$_REPAIR        =00000001        65        (2)       65      (2)
ENV$_SUPER         =00000001        65        (2)
ENV$_SYSTEM        =00000001        65        (2)       65      (2)
SEP_FUNCTIONAL     =00000002        65        (2)
SEP_REPAIR         =00000003        65        (2)
SIZ...             =00000008        65        (2)       65      (2)
```

```
                                                 +------------------------+
                                                 ! Macros Cross Reference !
                                                 +------------------------+
MACRO              SIZE          DEFINITION        REFERENCES...
-----              ----          ----------        -------------
$DEF               1             65      (2)
$DS_BGNMOD         1             65      (2)       65      (2)
$DS_ENVDEF         2             65      (2)       65      (2)
$EQU               1             65      (2)       65      (2)
$EQULS1            1             65      (2)       65      (2)
$EQULST            1             65      (2)       65      (2)
$GBLINI            2             65      (2)       65      (2)
$VIELD             1             65      (2)       65      (2)
$VIELD1            1             65      (2)       65      (2)

                                                 +------------------------+
                                                 ! Performance indicators !
                                                 +------------------------+
Phase                      Page faults    CPU Time       Elapsed Time
-----                      -----------    --------       ------------
Initialization                      27    00:00:00.08    00:00:00.61
Command processing                  25    00:00:00.23    00:00:00.97
Pass 1                             312    00:00:01.61    00:00:06.35
Symbol table sort                    0    00:00:00.01    00:00:00.01
Pass 2                              78    00:00:00.48    00:00:02.19
Symbol table output                  5    00:00:00.02    00:00:00.05
Psect synopsis output                4    00:00:00.03    00:00:00.09
Cross-reference output              25    00:00:00.14    00:00:00.28
Assembler run totals               481    00:00:02.61    00:00:10.60

The working set limit was 900 pages.
9370 bytes (19 pages) of virtual memory were used to buffer the intermediate code.
There were 10 pages of symbol table space allocated to hold 26 non-local and 0 local symbols.
71 source lines were read in Pass 1, producing 0 object records in Pass 2.
17 pages of virtual memory were used to define 7 macros.

                                                +--------------------------+
                                                ! Macro library statistics !
                                                +--------------------------+
Macro library name                              Macros defined
------------------                              --------------
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                       2
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                      3
TOTALS (all libraries)                                 5

100 GETS were required to define 5 macros.

There were 1 error, 0 warnings and 0 information messages, on lines:
   71 (2)

/LIS/CRO ENKAXG
```

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```
    (1)        1         ENKAXH: UNIBUS INTERFACE TEST
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    (8)     1417         TEST 8:  UNIBUS Functional Test
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    (10)    1534         SUBTEST 8.2:  Map Data Bus
    (12)    1591         SUBTEST 8.3:  Map Address Bus
    (13)    1723         SUBTEST 8.4:  Map Entry
    (14)    1819         SUBTEST 8.5:  CPU Read/Write
    (15)    1978         SUBTEST 8.6:  Interrupts
    (16)    2087         SUBTEST 8.7:  DATI 1
    (17)    2207         SUBTEST 8.8:  Map Select
    (18)    2313         SUBTEST 8.9:  DATI 2
    (19)    2423         SUBTEST 8.10:  DATO
    (20)    2521         SUBTEST 8.11:  DATOB
    (21)    2625         SUBTEST 8.12:  DATIP/DATO
    (22)    2750         SUBTEST 8.13:  Address Offset DATI
    (23)    2852         SUBTEST 8.14:  Address Offset DATO
    (24)    2950         SUBTEST 8.15:  Address Offset DATOB
    (25)    3049         SUBTEST 8.16:  Address Offset DATIP/DATO
    (26)    3167         SUBTEST 8.17:  Map Function
    (27)    3276         SUBTEST 8.18:  Address Offset Map Functi
    (28)    3386         SUBTEST 8.19:  Page Boundary Write Error
    (29)    3469         SUBTEST 8.20:  Map Parity Error
    (30)    3553         SUBTEST 8.21:  NXM Error
    (31)    3630         SUBTEST 8.22:  Map Invalid
    (32)    3704         TEST 9:  UBE Multi-transfer Test
    (33)    3757         SUBTEST 9.1:  UBE Multi-transfer 1
    (34)    3944         SUBTEST 9.2:  UBE Multi-transfer 2
```

```
0000            .SBTTL  ENKAXH: UNIBUS INTERFACE TEST
0000            .TITLE  ENKAXH  VAX-11/730 Specific CPU Cluster Exerciser
0000            .IDENT  /1-3/
0000
0000    ;
0000    ; Copyright (C) 1981
0000    ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000    ;
0000    ; This software is furnished  under a license for use only on a single
0000    ; computer  system and  may be  copied only with  the inclusion of the
0000    ; above copyright notice.  This software, or any other copies thereof,
0000    ; may not be provided or  otherwise made available to any other person
0000    ; except for use on such system and to one who agrees to these license
0000    ; terms.  Title to and  ownership of the  software  shall at all times
0000    ; remain in DEC.
0000    ;
0000    ; The information in this software is subject to change without notice
0000    ; and should  not be construed  as a commitment  by Digital  Equipment
0000    ; Corporation.
0000    ;
0000    ; DEC assumes  no  responsibility  for  the use or  reliability of its
0000    ; software on equipment which is not supplied by DEC.
0000    ;
0000    ;
0000    ;++
0000    ; Facility:       VAX Architecture Diagnostic.
0000    ;
0000    ; Abstract:       This module consists of two tests that check the VAX-11/730
0000    ;                 Unibus interface (UBI). This includes testing of the interface CSR,
0000    ;                 MAP's, and different types of data transactions and exercising
0000    ;                 UBE's. This program runs under the Diagnostic Supervisor and
0000    ;                 is intended for use on a VAX 11/730 system.
0000    ;
0000    ; Environment:    VAX Diagnostic Supervisor.
0000    ;
0000    ; Author:         Rich Lewis      14-Oct-81       Version 5X
0000    ;
0000    ; Modified by:
0000    ;                 Kevin Martin    9-Nov-1982
0000    ;         01      The number of Unibus maps changed from 504 to 496.
0000    ;
0000    ;                 Tai-Chun Pan    01-Apr-83       Version 1.2
0000    ;
0000    ;                 Added quick flag on Test 7(TU58). If quick flag is set
0000    ;                 will skip subtest 4 through subtest 11.  Added event flag 3.
0000    ;                 If event flag 3 is set, will override protection,
0000    ;                 i.e., go ahead and write on tape.  If run APT & event flag 3
0000    ;                 is clear & tape is not scratch, will report an error.
0000    ;                 Modified Unibus sizer on Test 8 & 9. make test run faster.
0000    ;
0000    ;
0000    ;                 Tai-Chun Pan    03-Aug-83       Version 1.3
0000    ;
0000    ;                 fixed bugs on TEST 7 and error summary routine call when
0000    ;                 running under APT.
0000    ;
0000    ;--
```

```
                  0000    59         .SBTTL  DECLARATIONS
                  0000    60         .LIST   MEB
                  0000    61         .NLIST  CND
              00000000    62         .PSECT  ENKAXH, PAGE, NOWRT
                  0000    63         .LIBRARY        "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                  0000    64         $DS_BGNMOD      CEP_REPAIR, TN=8
                  0000       ;;;     Macro-32 Diagnostic macro library Version 6.10 "DIAG.MLB (137)"
                  0000    65
                  0000    66 ;
                  0000    67 ; Include files:
                  0000    68 ;
                  0000    69
                  0000    70         .LIBRARY        "ENKAX"         ; CPU Cluster Exerciser library.
                  0000    71
                  0000    75
                  0000    76         $DS_SCBDEF
                  0000    77         $DS_DSADEF
                  0000    78         $DS_DSDEF
                  0000    79         $DS_PARDEF
                  0000    80         $DS_PSLDEF
                  0000    81         $DS_ERRDEF
                  0000    82         $DS_DSSDEF
                  0000    83         $DS_HPODEF
                  0000    84         $DS_KA_DEF
                  0000    85         ENKAX_SECDEF
                  0000    86
                  0000    87 ;
                  0000    88 ; Own storage:
                  0000    89 ;
                  0000    90
                  0000    91 ; Bit positions and masks:
                  0000    92
         82007FFF 0000    93 M_MAP_WRTBL     =^X82007FFF             ; Map Entry writable bit mask
         7DFF8000 0000    94 M_MAP_NOWRT     =^X7DFF8000             ; Map Entry nonwritable bit mask
         02000000 0000    95 M_BYTE_OFF      =1@25                   ; Map Entry Byte-offset mask
         00000019 0000    96 V_BYTE_OFF      =25
         80000000 0000    97 M_MAP_VAL       =1@31                   ; Map Entry Valid bit mask
         0000001F 0000    98 V_MAP_VAL       =31
         02000000 0000    99 M_DSABL_ECC     =1@25                   ; Mem contrlr disable ECC
         04000000 0000   100 M_DIAG_MODE     =1@26                   ; Mem contrlr diagnostic mode
         20000000 0000   101 M_FRCE_TB_ERR   =1@29                   ; Mem contrlr force TB parity err
         00000001 0000   102 M_RUN           =1@0                    ; Interval Timer run bit
         00000000 0000   103 V_RUN           =0
         00000010 0000   104 M_TRANSFER      =1@4                    ; Interval Timer ICCS transfer bit
         00000004 0000   105 V_TRANSFER      =4
         00000040 0000   106 M_ENABLE        =1@6                    ; Interval Timer enable bit
         00000006 0000   107 V_ENABLE        =6
         00000080 0000   108 M_CLK_INTR      =1@7                    ; Interval Timer ICCS interrupt bit
         00000007 0000   109 V_CLK_INTR      =7
         80000000 0000   110 M_CLK_ERR       =1@31                   ; Interval Timer ICCS error bit
         0000001F 0000   111 V_CLK_ERR       =31
                  0000   112
                  0000   113
                  0000   114 ; Error flag positions and masks:
                  0000   115
         00000001 0000   116 M_NO_CSR        =1@0                    ; UBI CSR not accessible
         00000000 0000   117 V_NO_CSR        =0
```

```
00000002  0000   118 M_EXP_BR_INTR   =1@1                        ; expected BR4 interrupt
00000001  0000   119 V_EXP_BR_INTR   =1
00000004  0000   120 M_TIMEOUT       =1@2                        ; indicates Interval Timer expired
00000002  0000   121 V_TIMEOUT       =2
00000008  0000   122 M_BR_INTR       =1@3                        ; interrupt occurred flag
00000003  0000   123 V_BR_INTR       =3
00000010  0000   124 M_INTR_ERR      =1@4                        ; interrupt error flag
00000004  0000   125 V_INTR_ERR      =4
00000040  0000   126 M_UNX_SSYN_ERR  =1@6                        ; unexpected SSYN occurred
00000006  0000   127 V_UNX_SSYN_ERR  =6
00000080  0000   128 M_EXP_WR_ERR    =1@7                        ; expected UBI Write error
00000007  0000   129 V_EXP_WR_ERR    =7
00000200  0000   130 M_EXP_NXM_ERR   =1@9                        ; expected UBI NXM error
00000009  0000   131 V_EXP_NXM_ERR   =9
00000400  0000   132 M_EXP_PB_ERR    =1@10                       ; expected UBI Map Parity Error
0000000A  0000   133 V_EXP_PB_ERR    =10
00001000  0000   134 M_DATA_ERR      =1@12                       ; data error flag
0000000C  0000   135 V_DATA_ERR      =12
          0000   136
          0000   137
          0000   138 ; UBI CSR bit masks:
          0000   139
80000000  0000   140 M_UBI_RDS_ERR   =1@31                       ; Read Data Substitute (uncorr. ECC)
0000001F  0000   141 V_UBI_RDS_ERR   =31
00010000  0000   142 M_UBI_NXM_ERR   =1@16                       ; Non eXistent Memory reference
00000010  0000   143 V_UBI_NXM_ERR   =16
00008000  0000   144 M_UBI_PB_ERR    =1@15                       ; map Parity error
0000000F  0000   145 V_UBI_PB_ERR    =15
00004000  0000   146 M_UBI_WR_ERR    =1@14                       ; WRite error (write w/ invalid map)
0000000E  0000   147 V_UBI_WR_ERR    =14
8001C000  0000   148 M_UBI_STS       =<7@14>!<1@31>              ; all UBI CSR status bits
7FFE3FFF  0000   149 M_UBI_NON_STS   =<^X3FFF@17>!<^X3FFF>       ; UBI Don't-Care bits
          0000   150
          0000   151 ; UBE bit masks:
          0000   152
          0000   153 ; UBE CR 1
          0000   154
00000001  0000   155 M_GO            =1@0                        ; go
00000002  0000   156 M_BR4           =1@1                        ; bus request 4
00000004  0000   157 M_BR5           =1@2                        ; bus request 5
00000008  0000   158 M_BR6           =1@3                        ; bus request 6
00000010  0000   159 M_BR7           =1@4                        ; bus request 7
00000020  0000   160 M_NPR           =1@5                        ; non-processor request
00000040  0000   161 M_INT_ODNE      =1@6                        ; interrupt on done
00000080  0000   162 M_RDY           =1@7                        ; ready
00000007  0000   163 V_RDY           =7
00000000  0000   164 M_DATI          =0@8                        ; DATI
00000100  0000   165 M_DATIP         =1@8                        ; DATIP
00000200  0000   166 M_DATO          =2@8                        ; DATO
00000300  0000   167 M_DATOB         =3@8                        ; DATOB
00000000  0000   168 M_INT_BM        =0@10                       ; interrupt when bus master
00000400  0000   169 M_ONE_XFR       =1@10                       ; exec. one transfer until CCOVF
00000800  0000   170 M_TWO_XFR       =2@10                       ; exec. two transfers until CCOVF
00000C00  0000   171 M_RLS_BUS       =3@10                       ; release bus when master
00001000  0000   172 M_CC_DAT        =1@12                       ; enable transfer from CC reg.
00002000  0000   173 M_INH_ROL       =1@13                       ; inhibit rotate left on DATIP
00004000  0000   174 M_DATOB_IP      =1@14                       ; DATOB on DATIP
```

```
                          00008000  0000    175 M_ERR           =1@15                         ; error
                          0000000F  0000    176 V_ERR           =15
                                    0000    177
                                    0000    178 ; UBE CR 2
                                    0000    179
                          00000000  0000    180 M_EXT_MEM       =00@0                         ; allows access to low 32k
                          00000004  0000    181 M_INH_INC       =1@2                          ; inhibit incr. of CC and ADDR
                          00000008  0000    182 M_INH_SACK      =1@3                          ; inhibit SACK
                          00000010  0000    183 M_PWR_DN        =1@4                          ; begin power down sequence
                          00000020  0000    184 M_WNG_GNT       =1@5                          ; wrong grant back error
                          00000005  0000    185 V_WNG_GNT       =5
                          00000040  0000    186 M_MAX_LAT       =1@6                          ; maximum latency error
                          00000006  0000    187 V_MAX_LAT       =6
                          00000080  0000    188 M_NO_SACK       =1@7                          ; no CPU timeout on no SACK error
                          00000007  0000    189 V_NO_SACK       =7
                          00000100  0000    190 M_NO_SSYN       =1@8                          ; no SSYN timeout error
                          00000008  0000    191 V_NO_SSYN       =8
                          00000200  0000    192 M_WNG_A         =1@9                          ; wrong bus "A" lines error
                          00000009  0000    193 V_WNG_A         =9
                          00000400  0000    194 M_NO_GNT        =1@10                         ; no grant or not one grant error
                          0000000A  0000    195 V_NO_GNT        =10
                          00000800  0000    196 M_INT_SSYN      =1@11                         ; interrupt SSYN error
                          0000000B  0000    197 V_INT_SSYN      =11
                          00001000  0000    198 M_ENB_PB        =1@12                         ; enable parity bit "B"
                          00002000  0000    199 M_CCOVF         =1@13                         ; cycle count overflow
                          0000000D  0000    200 V_CCOVF         =13
                          00004000  0000    201 M_TM_DLY        =1@14                         ; time delay
                                    0000    202
                                    0000    203
                                    0000    204 ; Error Flag
                                    0000    205
                              0000  0000    206 W_FLAGS:        .WORD   0
                                    0002    207
                                    0002    208
                                    0002    209 ; UNIBUS Addresses
                                    0002    210
                          00F26010  0002    211 A_UBI_CSR       =^XF26010                     ; address of CSR
                          00F26800  0002    212 A_MAP_BGN       =^XF26800                     ; address of beginning of Map
                          00F26FFC  0002    213 A_MAP_END       =^XF26FFC                     ; address of last Map Entry
                          00FC0000  0002    214 A_UB_IO_SP      =^XFC0000                     ; base address of UNIBUS I/O space
                          00FFF00C  0002    215 A_SIMUL_GO      =^O77770014                   ; simultaneous Go address
                                    0002    216
                                    0002    217
                                    0002    218 ; UNIBUS Interrupt vector
                                    0002    219
                          00000348  0002    220 SCB$L_BE0       =^X348                        ; UBE 0 interrupt vector offset
                          0000034C  0002    221 SCB$L_BE1       =^X34C                        ; UBE 1 interrupt vector offset
                          00000350  0002    222 SCB$L_BE2       =^X350                        ; UBE 2 interrupt vector offset
                          00000354  0002    223 SCB$L_BE3       =^X354                        ; UBE 3 interrupt vector offset
                                    0002    224
                                    0002    225
                                    0002    226 ; Main Memory Storage:
                                    0002    227
                          FFFFFFFF  0002    228 FRST_VAL_MAP:   .LONG   -1                    ; first valid Map Number
FFFFFFFF'FFFFFFFF'FFFFFFFF'FFFFFFFF'  0006    229 V_VALID_MAPS:   .LONG   -1[16],0              ; bitvector for usable map entries
FFFFFFFF'FFFFFFFF'FFFFFFFF'FFFFFFFF'  0016
FFFFFFFF'FFFFFFFF'FFFFFFFF'FFFFFFFF'  0026
```

```
FFFFFFFF'FFFFFFFF'FFFFFFFF'FFFFFFFF'  0036
                           00000000   0046
                           00000000   004A    230 L_PAGE_NO:         .LONG                   ; page number
                           0000005E   004E    231 L_SAVE_CSR:        .BLKL   4               ; location to save UBI CSR
                           00000086   005E    232 L_EXP_DATA:        .BLKL   10              ; expected data
                           00500200   0086    233 L_NXM_ADR:         .LONG   ^X500200        ; non-existent memory location
                           00000000   008A    234 L_MAP_NUM:         .LONG                   ; map number
                           00000000   008E    235 L_PTRN:            .LONG                   ; holds data pattern for Multi Xfrs
                           000000A2   0092    236 L_PTRNS:           .BLKL   4               ; saved data patterns
                                 00   00A2    237 B_DONE_CT:         .BYTE                   ; number of UBEs done
                           00000000   00A3    238 L_MAPS_NEEDED:     .LONG                   ; number of maps needed
                           00000000   00A7    239 L_IPL:             .LONG                   ; IPLs used in Interrupt subtest
                           00000000   00AB    240 L_BR_LVL:          .LONG                   ; BR level used in Interrupt subtest
                           00000000   00AF    241 L_UBI_STATUS:      .LONG                   ; status word from channel services
                               0000   00B3    242 W_UBI_STS_2:       .WORD                   ; interrupt status word from chanl srvc
                               0000   00B5    243 W_VECTOR:          .WORD                   ; vector received
                           00000000   00B7    244 L_XFR_COUNT:       .LONG                   ; transfer count
                           FFF0BDC0   00BB    245 L_MXFR_TIME:       .LONG   -1000000        ; Max time allowed for mult xfer 1 sec
                        04 04 08 08   00BF    246 B_MAPS_REQ_1:      .BYTE   8,8,4,4         ; # of maps req'd in mult transfer 1
                        0C 08 04 04   00C3    247 B_MAPS_REQ_2:      .BYTE   4,4,8,12        ; # of maps req'd in mult transfer 2
                           00000000   00C7    248 L_BUFFER_ADR:      .LONG                   ; starting address of current buffer
                           00000000'  00CB    249 A_BUFRS_DFR_1:     .LONG   A_UBE_BUFFER_0,- ; buffer deferred address table Mxfr 1
                                      00CF    250                            A_UBE_BUFFER_0,-
                           00000000'  00CF    251                            A_UBE_BUFFER_2,-
                  00000000'00000000'  00D3    252                            A_UBE_BUFFER_3
                                      00DB    253 A_BUFRS_DFR_2:     .LONG   A_UBE_BUFFER_0,- ; buffer deferred address table Mxfr 2
                           00000000'  00DB    254                            A_UBE_BUFFER_1,-
                           00000000'  00DF    255                            A_UBE_BUFFER_2,-
                  00000000'00000000'  00E3    256                            A_UBE_BUFFER_3
                           000000FB   00EB    257 A_BUFFERS_1:       .BLKL   4               ; actual buffer addresses Mxfr 1
                           0000010B   00FB    258 A_BUFFERS_2:       .BLKL   4               ; actual buffer addresses Mxfr 2
                           00000000   010B    259 L_BUFFER_SIZE:     .LONG                   ; length of current buffer
                                      010F    260 L_BUF_SIZES_1:     .LONG   2000,-          ; word lengths of buffers Mxfr 1
                           000007D0   010F    261                            2000,-
                           000007D0   0113    262                            1000,-
                  000003E8 000003E8   0117    263                            1000
                                      011F    264 L_BUF_SIZES_2:     .LONG   1000,-          ; word lengths of buffers Mxfr 2
                           000003E8   011F    265                            1000,-
                           000003E8   0123    266                            2000,-
                  00000BB8 000007D0   0127    267                            3000
                                      012F    268
                                      012F    269 T_MXFR_1_DESC:     .LONG   T_M1_UBE_0,-    ; adrs of mxfr 1 descriptions
                           0000096B'  012F    270                            T_M1_UBE_1,-
                           000009F4'  0133    271                            T_M1_UBE_2,-
                  00000AA5'00000A62'  0137    272                            T_M1_UBE_3
                                      013F    273 T_MXFR_2_DESC:     .LONG   T_M2_UBE_0,-    ; adrs of mxfr 2 descriptions
                           00000AE8'  013F    274                            T_M2_UBE_1,-
                           00000B4C'  0143    275                            T_M2_UBE_2,-
                  00000C1E'00000BAD'  0147    276                            T_M2_UBE_3
                           0000015F   014F    277 L_INITL_MAP:       .BLKL   4               ; initial map numbers
                           00000000   015F    278 L_ERROR_CT:        .LONG                   ; error count
                           0000018B   0163    279 L_ERROR_LOG:       .BLKL   10
                                      018B    280
                           00000000   018B    281 L_INFO_BIT:        .LONG                   ; info bit pointer
                           00000000   018F    282 L_PAIR_SEP:        .LONG                   ; separation of redundant relation
                           00000000   0193    283 L_POSITION:        .LONG                   ; bit pointer
                           00000000   0197    284 L_TEMP_A:          .LONG                   ; temporary data
```

```
                00000000  019B   285 L_TEMP_B:       .LONG                        ; temporary data
                00000000  019F   286 L_POP:          .LONG                        ; population of ones
                00000000  01A3   287 L_RETRIEVE:     .LONG                        ; retrieved data
                          01A7   288
                          01A7   289 ; Misc.
                          01A7   290
                33550FFF  01A7   291 L_PATTERN       =^X33550FFF                  ; initial data pattern for Mult Xfrs
                00F20004  01A7   292 A_MEM_CSR_1     =^XF20004                    ; Memory CSR 1
                00000037  01A7   293 PR$L_UB_INIT    =^X37                        ; unibus init. internal register number
                          01A7   294
                          01A7   295
                          01A7   296 .SBTTL DATA TABLES
                          01A7   297
                          01A7   298 ; This data is used in the Map Data Bus subtest to float a one through a
                          01A7   299 ; field of zeros and a zero through a field of ones in the writable bits
                          01A7   300 ; (31,25,<14:0>) of a Map Entry to test that no data lines are stuck or
                          01A7   301 ; shorted.  Non-writable bits are ignored.
                          01A7   302
                00000000  01A7   303 MAP_ENT_TBL:    .LONG   ^X00000000           ; field of zeros
                00000001  01AB   304                 .LONG   ^X00000001
                00000002  01AF   305                 .LONG   ^X00000002
                00000004  01B3   306                 .LONG   ^X00000004
                00000008  01B7   307                 .LONG   ^X00000008
                00000010  01BB   308                 .LONG   ^X00000010
                00000020  01BF   309                 .LONG   ^X00000020
                00000040  01C3   310                 .LONG   ^X00000040
                00000080  01C7   311                 .LONG   ^X00000080
                00000100  01CB   312                 .LONG   ^X00000100
                00000200  01CF   313                 .LONG   ^X00000200
                00000400  01D3   314                 .LONG   ^X00000400
                00000800  01D7   315                 .LONG   ^X00000800
                00001000  01DB   316                 .LONG   ^X00001000
                00002000  01DF   317                 .LONG   ^X00002000
                00004000  01E3   318                 .LONG   ^X00004000
                02000000  01E7   319                 .LONG   ^X02000000
                80000000  01EB   320                 .LONG   ^X80000000
                82007FFF  01EF   321                 .LONG   ^X82007FFF           ; field of ones
                82007FFE  01F3   322                 .LONG   ^X82007FFE
                82007FFD  01F7   323                 .LONG   ^X82007FFD
                82007FFB  01FB   324                 .LONG   ^X82007FFB
                82007FF7  01FF   325                 .LONG   ^X82007FF7
                82007FEF  0203   326                 .LONG   ^X82007FEF
                82007FDF  0207   327                 .LONG   ^X82007FDF
                82007FBF  020B   328                 .LONG   ^X82007FBF
                82007F7F  020F   329                 .LONG   ^X82007F7F
                82007EFF  0213   330                 .LONG   ^X82007EFF
                82007DFF  0217   331                 .LONG   ^X82007DFF
                82007BFF  021B   332                 .LONG   ^X82007BFF
                820077FF  021F   333                 .LONG   ^X820077FF
                82006FFF  0223   334                 .LONG   ^X82006FFF
                82005FFF  0227   335                 .LONG   ^X82005FFF
                82003FFF  022B   336                 .LONG   ^X82003FFF
                80007FFF  022F   337                 .LONG   ^X80007FFF
                02007FFF  0233   338                 .LONG   ^X02007FFF
                          0237   339
                          0237   340
                          0237   341 ; This data table is generated during execution of the Map Address Bus subtest
```

```
                   0237   342 ; to store the Reed-Muller values generated at the time of execution.
                   0237   343
         00000257  0237   344 RD_MLLR_TBL:    .BLKL   8
                   0257   345
                   0257   346
                   0257   347 ; This table is used to store data retrieved from the Map Entries
                   0257   348
         00000277  0257   349 RETRIEVE_TBL:   .BLKL   8
                   0277   350
                   0277   351
                   0277   352 ; This table is used to store the values decoded from the retrieved data
                   0277   353
         00000297  0277   354 DECODE_TBL:     .BLKL   8
                   0297   355
                   0297   356
                   0297   357 ; This data table is used by the subroutine which generates the Reed-Muller
                   0297   358 ; representations of the numbers 0 - 7.
                   0297   359
             FFFF  0297   360 CODEVECTORS:    .WORD    ^XFFFF
             5555  0299   361                 .WORD    ^X5555
             3333  029B   362                 .WORD    ^X3333
             0F0F  029D   363                 .WORD    ^X0F0F
                   029F   364
                   029F   365
                   029F   366 ; This data is used in the CPU Read/Write subtest to test that no bits
                   029F   367 ; in the UBE address and data registers are stuck or shorted and in the
                   029F   368 ; transfer subtests to test the integrity of the data path.
                   029F   369
             5555  029F   370 W_PTRN_TBL:     .WORD    ^X5555
             AAAA  02A1   371                 .WORD    ^XAAAA
             3333  02A3   372                 .WORD    ^X3333
             0F0F  02A5   373                 .WORD    ^X0F0F
             00FF  02A7   374                 .WORD    ^X00FF
             0000  02A9   375                 .WORD    ^X0000                  ; terminator
                   02AB   376
                   02AB   377
                   02AB   378 ; The following is a table of addresses of the UBE registers.
                   02AB   379
                   02AB   380 A_UBE_ADR_TBL:
         00FFF008  02AB   381 A_BE0_CLR_ERR:  .LONG    ^077770010              ; clear error address
         00FFF000  02AF   382 A_BE0_DB:       .LONG    ^077770000              ; adr of Data reg
         00FFF002  02B3   383 A_BE0_CC:       .LONG    ^077770002              ; adr of Cycle Count reg
         00FFF004  02B7   384 A_BE0_BA:       .LONG    ^077770004              ; adr of Address reg
         00FFF00E  02BB   385 A_BE0_CR2:      .LONG    ^077770016              ; adr of Control reg 2
         00FFF006  02BF   386 A_BE0_CR1:      .LONG    ^077770006              ; adr of Control reg 1
         00FFF032  02C3   387 A_BE3_CC:       .LONG    ^077770062              ; adr of Cyc Ct UBE 3
         00FFF036  02C7   388 A_BE3_CR1:      .LONG    ^077770066              ; adr of Cont Reg 1 UBE 3
                   02CB   389
                   02CB   390
                   02CB   391
             0000  02CB   392 UBE_DATI_1:     .WORD    0                       ; Clear previous errors
             0000  02CD   393                 .WORD    0                       ; Data Register
             FFFF  02CF   394                 .WORD    -1                      ; Cycle Count
             0000  02D1   395                 .WORD    0                       ; Address Register
             0000  02D3   396                 .WORD    0                       ; Control Register 2
             04F1  02D5   397                 .WORD    <M_GO!M_BR7!M_NPR!M_INT_ODNE!M_RDY!M_DATI!M_ONE_XFR>
                   02D7   398
```

```
ZZ-
ENK
1-3

72
20
6C
6C
64

74
20
2F

63
65
70
74

76
76
3D
```

```
0000  02D7   399 UBE_DATIP_1:     .WORD   0                              ; Clear previous errors
0000  02D9   400                  .WORD   0                              ; Data Register
FFFF  02DB   401                  .WORD   -1                             ; Cycle Count
0000  02DD   402                  .WORD   0                              ; Address Register
0000  02DF   403                  .WORD   0                              ; Control Register 2
05F1  02E1   404                  .WORD   <M_GO!M_BR7!M_NPR!M_INT_ODNE!M_RDY!M_DATIP!M_ONE_XFR>
      02E3   405
0000  02E3   406 UBE_DATOB_1:     .WORD   0                              ; Clear previous errors
0000  02E5   407                  .WORD   0                              ; Data Register
FFFF  02E7   408                  .WORD   -1                             ; Cycle Count
0000  02E9   409                  .WORD   0                              ; Address Register
0000  02EB   410                  .WORD   0                              ; Control Register 2
07F1  02ED   411                  .WORD   <M_GO!M_BR7!M_NPR!M_INT_ODNE!M_RDY!M_DATOB!M_ONE_XFR>
      02EF   412
0000  02EF   413 UBE_DATO_1:      .WORD   0                              ; Clear previous errors
0000  02F1   414                  .WORD   0                              ; Data Register
FFFF  02F3   415                  .WORD   -1                             ; Cycle Count
0000  02F5   416                  .WORD   0                              ; Address Register
0000  02F7   417                  .WORD   0                              ; Control Register 2
06F1  02F9   418                  .WORD   <M_GO!M_BR7!M_NPR!M_INT_ODNE!M_RDY!M_DATO!M_ONE_XFR>
      02FB   419
0000  02FB   420 UBE_PB_ERR:      .WORD   0                              ; Clear previous errors
0000  02FD   421                  .WORD   0                              ; Data Register
FFFF  02FF   422                  .WORD   -1                             ; Cycle Count
0000  0301   423                  .WORD   0                              ; Address Register
1000  0303   424                  .WORD   M_ENB_PB                       ; Control Register 2
02F1  0305   425                  .WORD   <M_GO!M_BR7!M_INT_ODNE!M_NPR!M_DATO!M_RDY>
      0307   426
0000  0307   427 UBE_BR7_INTR:    .WORD   0                              ; Clear previous errors
0000  0309   428                  .WORD   0                              ; Data Register
0000  030B   429                  .WORD   0                              ; Cycle Count
0000  030D   430                  .WORD   0                              ; Address Register
0000  030F   431                  .WORD   0                              ; Control Register 2
0091  0311   432                  .WORD   <M_GO!M_BR7!M_RDY!M_INT_BM> ; Control Reg 1
      0313   433
0000  0313   434 UBE_BR6_INTR:    .WORD   0                              ; Clear previous errors
0000  0315   435                  .WORD   0                              ; Data Register
0000  0317   436                  .WORD   0                              ; Cycle Count
0000  0319   437                  .WORD   0                              ; Address Register
0000  031B   438                  .WORD   0                              ; Control Register 2
0089  031D   439                  .WORD   <M_GO!M_BR6!M_RDY!M_INT_BM> ; Control Reg 1
      031F   440
0000  031F   441 UBE_BR5_INTR:    .WORD   0                              ; Clear previous errors
0000  0321   442                  .WORD   0                              ; Data Register
0000  0323   443                  .WORD   0                              ; Cycle Count
0000  0325   444                  .WORD   0                              ; Address Register
0000  0327   445                  .WORD   0                              ; Control Register 2
0085  0329   446                  .WORD   <M_GO!M_BR5!M_RDY!M_INT_BM> ; Control Reg 1
      032B   447
0000  032B   448 UBE_BR4_INTR:    .WORD   0                              ; Clear previous errors
0000  032D   449                  .WORD   0                              ; Data Register
0000  032F   450                  .WORD   0                              ; Cycle Count
0000  0331   451                  .WORD   0                              ; Address Register
0000  0333   452                  .WORD   0                              ; Control Register 2
0083  0335   453                  .WORD   <M_GO!M_BR4!M_RDY!M_INT_BM> ; Control Reg 1
      0337   454
0000  0337   455 UBE_0_MULT_1:    .WORD   0                              ; Clear previous errors
```

```
0000  0339   456                       .WORD    0                        ; Data Register
F830  033B   457                       .WORD    -2000                    ; Cycle Count
0000  033D   458                       .WORD    0                        ; Address Register
0000  033F   459                       .WORD    0                        ; Control Register 2
45C8  0341   460                       .WORD    <M_RDY!M_BR6!M_INT_ODNE!M_DATIP!M_ONE_XFR!M_DATOB_IP>
      0343   461
0000  0343   462 UBE_1_MULT_1:         .WORD    0                        ; Clear previous errors
0000  0345   463                       .WORD    0                        ; Data Register
F830  0347   464                       .WORD    -2000                    ; Cycle Count
0000  0349   465                       .WORD    0                        ; Address Register
0000  034B   466                       .WORD    0                        ; Control Register 2
25F0  034D   467                       .WORD    <M_RDY!M_BR7!M_NPR!M_INT_ODNE!M_DATIP!M_ONE_XFR!M_INH_ROL>
      034F   468
0000  034F   469 UBE_2_MULT_1:         .WORD    0                        ; Clear previous errors
CCCC  0351   470                       .WORD    ^XCCCC                   ; Data Register
FC18  0353   471                       .WORD    -1000                    ; Cycle Count
0000  0355   472                       .WORD    0                        ; Address Register
0000  0357   473                       .WORD    0                        ; Control Register 2
06F0  0359   474                       .WORD    <M_RDY!M_BR7!M_NPR!M_INT_ODNE!M_DATO!M_ONE_XFR>
      035B   475
0000  035B   476 UBE_3_MULT_1:         .WORD    0                        ; Clear previous errors
5555  035D   477                       .WORD    ^X5555                   ; Data Register
FC18  035F   478                       .WORD    -1000                    ; Cycle Count
0000  0361   479                       .WORD    0                        ; Address Register
0000  0363   480                       .WORD    0                        ; Control Register 2
06C4  0365   481                       .WORD    <M_RDY!M_BR5!M_INT_ODNE!M_DATO!M_ONE_XFR>
      0367   482
0000  0367   483 UBE_0_MULT_2:         .WORD    0                        ; Clear previous errors
0000  0369   484                       .WORD    0                        ; Data Register
F830  036B   485                       .WORD    -2000                    ; Cycle Count
0000  036D   486                       .WORD    0                        ; Address Register
0000  036F   487                       .WORD    0                        ; Control Register 2
1BE8  0371   488                       .WORD    <M_RDY!M_BR6!M_NPR!M_INT_ODNE!M_DATOB!M_TWO_XFR!M_CC_DAT>
      0373   489
0000  0373   490 UBE_1_MULT_2:         .WORD    0                        ; Clear previous errors
0000  0375   491                       .WORD    0                        ; Data Register
FC18  0377   492                       .WORD    -1000                    ; Cycle Count
0000  0379   493                       .WORD    0                        ; Address Register
0000  037B   494                       .WORD    0                        ; Control Register 2
05F0  037D   495                       .WORD    <M_RDY!M_BR7!M_NPR!M_INT_ODNE!M_DATIP!M_ONE_XFR>
      037F   496
0000  037F   497 UBE_2_MULT_2:         .WORD    0                        ; Clear previous errors
0000  0381   498                       .WORD    0                        ; Data Register
FC18  0383   499                       .WORD    -1000                    ; Cycle Count
0000  0385   500                       .WORD    0                        ; Address Register
0000  0387   501                       .WORD    0                        ; Control Register 2
08C4  0389   502                       .WORD    <M_RDY!M_BR5!M_DATI!M_TWO_XFR!M_INT_ODNE>
      038B   503
0000  038B   504 UBE_3_MULT_2:         .WORD    0                        ; Clear previous errors
0000  038D   505                       .WORD    0                        ; Data Register
FFFF  038F   506                       .WORD    -1                       ; Cycle Count
0000  0391   507                       .WORD    0                        ; Address Register
0000  0393   508                       .WORD    0                        ; Control Register 2
04D0  0395   509                       .WORD    <M_RDY!M_BR7!M_DATI!M_ONE_XFR!M_INT_ODNE>
      0397   510
      0397   511
```

```
                                       0397     516
                                       0397     517 .SBTTL  ERROR MESSAGES
                                       0397     518 ;------------------------------------------------------------------------
                                       0397     519 T_NO_BEO:
69 76 65 64 20 45 42 55 20 2F 21 00'   0397     520             .ASCIC  "!/ UBE device 0 not selected. Exiting test."
6C 65 73 20 74 6F 6E 20 30 20 65 63    03A3
69 74 69 78 45 20 2E 64 65 74 63 65    03AF
            2E 74 73 65 74 20 67 6E    03BB
                                 2B    0397
                                       03C3     521 ;------------------------------------------------------------------------
                                       03C3     522 T_NO_ACCESS:
65 63 63 61 6E 69 20 45 42 55 20 00'   03C3     523             .ASCIC  " UBE inaccessible.  Exiting test."
69 78 45 20 20 2E 65 6C 62 69 73 73    03CF
      2E 74 73 65 74 20 67 6E 69 74    03DB
                                 21    03C3
                                       03E5     524 ;------------------------------------------------------------------------
                                       03E5     525 T_UBE_ADR:
20 44 45 54 43 45 50 58 45 20 20 00'   03E5     526             .ASCIC  "  EXPECTED UBE at Address = !OL(O) = !XL(X).!/"
65 72 64 64 41 20 74 61 20 45 42 55    03F1
20 29 4F 28 4C 4F 21 20 3D 20 73 73    03FD
   2F 21 2E 29 58 28 4C 58 21 20 3D    0409
                                 2E    03E5
                                       0414     527 ;------------------------------------------------------------------------
                                       0414     528 T_NO_UBE:
20 73 45 42 55 20 6F 4E 20 2F 21 00'   0414     529             .ASCIC  "!/ No UBEs selected. Exiting test."
78 45 20 2E 64 65 74 63 65 6C 65 73    0420
   2E 74 73 65 74 20 67 6E 69 74 69    042C
                                 22    0414
                                       0437     530 ;------------------------------------------------------------------------
                                       0437     531 T_NO_MAPS:
6C 62 61 73 75 20 6F 4E 20 2F 21 00'   0437     532             .ASCIC  "!/ No usable MAPS available.  Exiting test."
6C 69 61 76 61 20 53 50 41 4D 20 65    0443
69 74 69 78 45 20 20 2E 65 6C 62 61    044F
            2E 74 73 65 74 20 67 6E    045B
                                 2B    0437
                                       0463     533 ;------------------------------------------------------------------------
                                       0463     534 T_CSR_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00'   0463     535             .ASCIC  " Attempted to test UNIBUS CSR."
42 49 4E 55 20 74 73 65 74 20 6F 74    046F
            2E 52 53 43 20 53 55       047B
                                 1E    0463
                                       0482     536 ;------------------------------------------------------------------------
                                       0482     537 T_MAP_DBUS_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00'   0482     538             .ASCIC  " Attempted to test UNIBUS Map data lines."
42 49 4E 55 20 74 73 65 74 20 6F 74    048E
20 61 74 61 64 20 70 61 4D 20 53 55    049A
               2E 73 65 6E 69 6C       04A6
                                 29    0482
                                       04AC     539 ;------------------------------------------------------------------------
                                       04AC     540 T_MAP_ABUS_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00'   04AC     541             .ASCIC  " Attempted to test UNIBUS Map address lines."
42 49 4E 55 20 74 73 65 74 20 6F 74    04B8
65 72 64 64 61 20 70 61 4D 20 53 55    04C4
      2E 73 65 6E 69 6C 20 73 73       04D0
                                 2C    04AC
                                       04D9     542 ;------------------------------------------------------------------------
                                       04D9     543 T_MAP_ENT_ERR:
```

```
20 64 65 74 70 6D 65 74 74 41 20 00' 04D9   544            .ASCIC  " Attempted to test writable bits of UNIBUS Map Entries."
74 69 72 77 20 74 73 65 74 20 6F 74  04E5
66 6F 20 73 74 69 62 20 65 6C 62 61  04F1
20 70 61 4D 20 53 55 42 49 4E 55 20  04FD
            2E 73 65 69 72 74 6E 45  0509
                                 37  04D9
                                     0511   545 ;------------------------------------------------------------------------
                                     0511   546 T_ADR_REG_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 0511   547            .ASCIC  " Attempted CPU access to UBE Address register."
74 20 73 73 65 63 63 61 20 55 50 43  051D
73 65 72 64 64 41 20 45 42 55 20 6F  0529
   2E 72 65 74 73 69 67 65 72 20 73  0535
                                 2E  0511
                                     0540   548 ;------------------------------------------------------------------------
                                     0540   549 T_DATA_REG_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 0540   550            .ASCIC  " Attempted CPU access to UBE Data register."
74 20 73 73 65 63 63 61 20 55 50 43  054C
72 20 61 74 61 44 20 45 42 55 20 6F  0558
            2E 72 65 74 73 69 67 65  0564
                                 2B  0540
                                     056C   551 ;------------------------------------------------------------------------
                                     056C   552 T_DATI_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 056C   553            .ASCIC  " Attempted UNIBUS DATI operation."
20 49 54 41 44 20 53 55 42 49 4E 55  0578
      2E 6E 6F 69 74 61 72 65 70 6F  0584
                                 21  056C
                                     058E   554 ;------------------------------------------------------------------------
                                     058E   555 T_D_PATH_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 058E   556            .ASCIC  " Attempted UNIBUS Data Path test."
20 61 74 61 44 20 53 55 42 49 4E 55  059A
      2E 74 73 65 74 20 68 74 61 50  05A6
                                 21  058E
                                     05B0   557 ;------------------------------------------------------------------------
                                     05B0   558 T_MAP_SEL_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 05B0   559            .ASCIC  " Attempted UNIBUS Map Select test."
53 20 70 61 4D 20 53 55 42 49 4E 55  05BC
   2E 74 73 65 74 20 74 63 65 6C 65  05C8
                                 22  05B0
                                     05D3   560 ;------------------------------------------------------------------------
                                     05D3   561 T_DATIP_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 05D3   562            .ASCIC  " Attempted UNIBUS DATIP/DATO operation."
50 49 54 41 44 20 53 55 42 49 4E 55  05DF
74 61 72 65 70 6F 20 4F 54 41 44 2F  05EB
                        2E 6E 6F 69  05F7
                                 27  05D3
                                     05FB   563 ;------------------------------------------------------------------------
                                     05FB   564 T_DATOB_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 05FB   565            .ASCIC  " Attempted UNIBUS DATOB operation."
42 4F 54 41 44 20 53 55 42 49 4E 55  0607
   2E 6E 6F 69 74 61 72 65 70 6F 20  0613
                                 22  05FB
                                     061E   566 ;------------------------------------------------------------------------
                                     061E   567 T_DATO_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 061E   568            .ASCIC  " Attempted UNIBUS DATO operation."
20 4F 54 41 44 20 53 55 42 49 4E 55  062A
      2E 6E 6F 69 74 61 72 65 70 6F  0636
                                 21  061E
```

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                                    0640     569 ;-------------------------------------------------------------------------
                                    0640     570 T_AO_DATO_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 0640     571           .ASCIC  " Attempted UNIBUS DATO operation in Address Offset mode."
20 4F 54 41 44 20 53 55 42 49 4E 55  064C
6E 69 20 6E 6F 69 74 61 72 65 70 6F  0658
66 66 4F 20 73 73 65 72 64 64 41 20  0664
         2E 65 64 6F 6D 20 74 65 73  0670
                                 38  0640
                                    0679     572 ;-------------------------------------------------------------------------
                                    0679     573 T_AO_DATOB_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 0679     574           .ASCIC  " Attempted UNIBUS DATOB operation in Address Offset mode."
42 4F 54 41 44 20 53 55 42 49 4E 55  0685
69 20 6E 6F 69 74 61 72 65 70 6F 20  0691
66 4F 20 73 73 65 72 64 64 41 20 6E  069D
      2E 65 64 6F 6D 20 74 65 73 66  06A9
                                 39  0679
                                    06B3     575 ;-------------------------------------------------------------------------
                                    06B3     576 T_AO_DATI_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 06B3     577           .ASCIC  " Attempted UNIBUS DATI operation in Address Offset mode."
20 49 54 41 44 20 53 55 42 49 4E 55  06BF
6E 69 20 6E 6F 69 74 61 72 65 70 6F  06CB
66 66 4F 20 73 73 65 72 64 64 41 20  06D7
         2E 65 64 6F 6D 20 74 65 73  06E3
                                 38  06B3
                                    06EC     578 ;-------------------------------------------------------------------------
                                    06EC     579 T_AO_DATIP_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 06EC     580           .ASCIC  " Attempted UNIBUS DATIP/DATO operation in Address Offset mode."
50 49 54 41 44 20 53 55 42 49 4E 55  06F8
74 61 72 65 70 6F 20 4F 54 41 44 2F  0704
65 72 64 64 41 20 6E 69 20 6E 6F 69  0710
6F 6D 20 74 65 73 66 66 4F 20 73 73  071C
                           2E 65 64  0728
                                 3E  06EC
                                    072B     581 ;-------------------------------------------------------------------------
                                    072B     582 T_PG_BND_WR_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 072B     583           .ASCIC  " Attempted to cause PAGE BOUNDARY WRITE ERROR."
47 41 50 20 65 73 75 61 63 20 6F 74  0737
57 20 59 52 41 44 4E 55 4F 42 20 45  0743
   2E 52 4F 52 52 45 20 45 54 49 52  074F
                                 2E  072B
                                    075A     584 ;-------------------------------------------------------------------------
                                    075A     585 T_MAP_FCN_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 075A     586           .ASCIC  " Attempted testing of UBI mapping function."
55 20 66 6F 20 67 6E 69 74 73 65 74  0766
66 20 67 6E 69 70 70 61 6D 20 49 42  0772
         2E 6E 6F 69 74 63 6E 75  077E
                                 2B  075A
                                    0786     587 ;-------------------------------------------------------------------------
                                    0786     588 T_PB_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 0786     589           .ASCIC  " Attempted to generate Unibus Map Parity Error."
20 65 74 61 72 65 6E 65 67 20 6F 74  0792
50 20 70 61 4D 20 73 75 62 69 6E 55  079E
2E 72 6F 72 72 45 20 79 74 69 72 61  07AA
                                 2F  0786
                                    07B6     590 ;-------------------------------------------------------------------------
                                    07B6     591 T_NXM_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 07B6     592           .ASCIC  " Attempted to generate Unibus NXM Error."
```

```
20 65 74 61 72 65 6E 65 67 20 6F 74  07C2
45 20 4D 58 4E 20 73 75 62 69 6E 55  07CE
               2E 72 6F 72 72  07DA
                           28  07B6
                               07DF    593 ;---------------------------------------------------------------------------
                               07DF    594 T_INTR_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 07DF    595          .ASCIC  " Attempted to initiate Bus Request Interrupt."
20 65 74 61 69 74 69 6E 69 20 6F 74  07EB
20 74 73 65 75 71 65 52 20 73 75 42  07F7
      2E 74 70 75 72 72 65 74 6E 49  0803
                           2D  07DF
                               080D    596 ;---------------------------------------------------------------------------
                               080D    597 T_MAP_INV_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 080D    598          .ASCIC  " Attempted access through invalid Map Entry."
75 6F 72 68 74 20 73 73 65 63 63 61  0819
4D 20 64 69 6C 61 76 6E 69 20 68 67  0825
      2E 79 72 74 6E 45 20 70 61  0831
                           2C  080D
                               083A    599 ;---------------------------------------------------------------------------
                               083A    600 T_MULT1_ERR:
20 64 65 74 70 6D 65 74 74 41 20 00' 083A    601          .ASCIC  " Attempted to create traffic on the UNIBUS."
72 74 20 65 74 61 65 72 63 20 6F 74  0846
65 68 74 20 6E 6F 20 63 69 66 66 61  0852
         2E 53 55 42 49 4E 55 20  085E
                           2B  083A
                               0866    602 ;---------------------------------------------------------------------------
                               0866    603 T_MXFR_D_ERR:
20 29 44 28 57 55 21 20 20 2F 21 00' 0866    604          .ASCIC  "!/  !UW(D) data word!%S in error."
53 25 21 64 72 6F 77 20 61 74 61 64  0872
      2E 72 6F 72 72 65 20 6E 69 20  087E
                           21  0866
                               0888    605 ;---------------------------------------------------------------------------
                               0888    606 T_NO_CSR_ERR:
52 53 43 20 49 42 55 20 20 2F 21 00' 0888    607          .ASCIC  "!/  UBI CSR failed to respond when accessed."
72 20 6F 74 20 64 65 6C 69 61 66 20  0894
20 6E 65 68 77 20 64 6E 6F 70 73 65  08A0
      2E 64 65 73 73 65 63 63 61  08AC
                           2C  0888
                               08B5    608 ;---------------------------------------------------------------------------
                               08B5    609 T_D_ERR_HDR:
6C 6F 66 20 65 68 54 20 20 2F 21 00' 08B5    610          .ASCIC  "!/  The following data error occurred:!/"-
20 61 74 61 64 20 67 6E 69 77 6F 6C  08C1
72 72 75 63 63 6F 20 72 6F 72 72 65  08CD
               2F 21 3A 64 65  08D9
20 20 20 6E 6F 69 74 61 63 6F 4C 09  08DE    611                 "       Location   Expected      Actual         XOR!/"-
20 20 09 64 65 74 63 65 70 78 45 20  08EA
20 20 20 20 20 20 6C 61 75 74 63 41  08F6
         2F 21 52 4F 58 20 20 20  0902
20 20 20 2D 2D 2D 2D 2D 2D 2D 2D 09  090A    612                 "       --------   --------    --------    --------!/"
20 20 20 2D 2D 2D 2D 2D 2D 2D 2D 20  0916
20 20 20 2D 2D 2D 2D 2D 2D 2D 2D 20  0922
   2F 21 2D 2D 2D 2D 2D 2D 2D 2D 20  092E
                           83  08B5
                               0939    613 ;---------------------------------------------------------------------------
                               0939    614 T_MXFR_TYPE:
65 66 73 6E 61 72 54 20 20 2F 21 00' 0939    615          .ASCIC  "!/  Transfer description:"
6F 69 74 70 69 72 63 73 65 64 20 72  0945
```

```
                              3A 6E 0951
                                 19 0939
                                    0953   616 ;-------------------------------------------------------------------------------
                                    0953   617 T_BUFF_ADR:
20 72 65 66 66 75 42 20 20 2F 21 00' 0953   618             .ASCIC  "!/  Buffer address:    !XL"
4C 58 21 09 3A 73 73 65 72 64 64 61 095F
                                 17 0953
                                    096B   619 ;-------------------------------------------------------------------------------
                                    096B   620 T_M1_UBE_0:
20 29 44 28 30 30 30 32 09 2F 21 00' 096B   621             .ASCIC  "!/     2000(D) BR6 DATIP/DATOB single-word transfers with"-
41 44 2F 50 49 54 41 44 20 36 52 42 0977
77 2D 65 6C 67 6E 69 73 20 42 4F 54 0983
72 65 66 73 6E 61 72 74 20 64 72 6F 098F
                  68 74 69 77 20 73 099B
65 6C 20 65 74 61 74 6F 72 09 2F 21 09A1   622                     "!/     rotate left after DATIP, interrupt on done, same"-
54 41 44 20 72 65 74 66 61 20 74 66 09AD
70 75 72 72 65 74 6E 69 20 2C 50 49 09B9
73 20 2C 65 6E 6F 64 20 6E 6F 20 74 09C5
                           65 6D 61 09D1
73 61 20 72 65 66 66 75 62 09 2F 21 09D4   623                     "!/     buffer as UBE 1 (if selected)"
73 20 66 69 28 20 31 20 45 42 55 20 09E0
            29 64 65 74 63 65 6C 65 09EC
                                 88 096B
                                    09F4   624 ;-------------------------------------------------------------------------------
                                    09F4   625 T_M1_UBE_1:
20 29 44 28 30 30 30 32 09 2F 21 00' 09F4   626             .ASCIC  "!/     2000(D) NPR DATIP/DATO single-word transfers without"-
41 44 2F 50 49 54 41 44 20 52 50 4E 0A00
6F 77 2D 65 6C 67 6E 69 73 20 4F 54 0A0C
73 72 65 66 73 6E 61 72 74 20 64 72 0A18
            74 75 6F 68 74 69 77 20 0A24
69 20 2C 65 74 61 74 6F 72 09 2F 21 0A2C   627                     "!/     rotate, interrupt on done BR7, same buffer as UBE 0"
20 6E 6F 20 74 70 75 72 72 65 74 6E 0A38
61 73 20 2C 37 52 42 20 65 6E 6F 64 0A44
73 61 20 72 65 66 66 75 62 20 65 6D 0A50
                  30 20 45 42 55 20 0A5C
                                 6D 09F4
                                    0A62   628 ;-------------------------------------------------------------------------------
                                    0A62   629 T_M1_UBE_2:
20 29 44 28 30 30 30 31 09 2F 21 00' 0A62   630             .ASCIC  "!/     1000(D) NPR DATO single-word transfers, interrupt on"-
6E 69 73 20 4F 54 41 44 20 52 50 4E 0A6E
61 72 74 20 64 72 6F 77 2D 65 6C 67 0A7A
65 74 6E 69 20 2C 73 72 65 66 73 6E 0A86
            6E 6F 20 74 70 75 72 72 0A92
   37 52 42 20 65 6E 6F 64 09 2F 21 0A9A   631                     "!/     done BR7"
                                 42 0A62
                                    0AA5   632 ;-------------------------------------------------------------------------------
                                    0AA5   633 T_M1_UBE_3:
20 29 44 28 30 30 30 31 09 2F 21 00' 0AA5   634             .ASCIC  "!/     1000(D) BR5 DATO single-word transfers, interrupt on"-
6E 69 73 20 4F 54 41 44 20 35 52 42 0AB1
61 72 74 20 64 72 6F 77 2D 65 6C 67 0ABD
65 74 6E 69 20 2C 73 72 65 66 73 6E 0AC9
            6E 6F 20 74 70 75 72 72 0AD5
   35 52 42 20 65 6E 6F 64 09 2F 21 0ADD   635                     "!/     done BR5"
                                 42 0AA5
                                    0AE8   636 ;-------------------------------------------------------------------------------
                                    0AE8   637 T_M2_UBE_0:
20 29 44 28 30 30 30 32 09 2F 21 00' 0AE8   638             .ASCIC  "!/     2000(D) NPR DATOB double-word transfers, data from"-
```

```
6F 64 20 42 4F 54 41 44 20 52 50 4E  0AF4
72 74 20 64 72 6F 77 2D 65 6C 62 75  0B00
74 61 64 20 2C 73 72 65 66 73 6E 61  0B0C
                  6D 6F 72 66 20 61  0B18
75 6F 43 20 65 6C 63 79 43 09 2F 21  0B1E   639                       "!/      Cycle Count register, interrupt on done BR6"
2C 72 65 74 73 69 67 65 72 20 74 6E  0B2A
6F 20 74 70 75 72 72 65 74 6E 69 20  0B36
      36 52 42 20 65 6E 6F 64 20 6E  0B42
                                 63  0AE8
                                     0B4C   640 ;----------------------------------------------------------------------------
                                     0B4C   641 T_M2_UBE_1:
20 29 44 28 30 30 30 31 09 2F 21 00' 0B4C   642             .ASCIC    "!/      1000(D) NPR DATIP/DATO single-word transfers with"-
41 44 2F 50 49 54 41 44 20 52 50 4E  0B58
6F 77 2D 65 6C 67 6E 69 73 20 4F 54  0B64
73 72 65 66 73 6E 61 72 74 20 64 72  0B70
                  68 74 69 77 20  0B7C
66 61 20 65 74 61 74 6F 72 09 2F 21  0B81   643                       "!/      rotate after DATIP, interrupt on done BR7"
69 20 2C 50 49 54 41 44 20 72 65 74  0B8D
20 6E 6F 20 74 70 75 72 72 65 74 6E  0B99
         37 52 42 20 65 6E 6F 64  0BA5
                                 60  0B4C
                                     0BAD   644 ;----------------------------------------------------------------------------
                                     0BAD   645 T_M2_UBE_2:
20 29 44 28 30 30 30 31 09 2F 21 00' 0BAD   646             .ASCIC    "!/      1000(D) BR5 DATI double-word transfers, interrupt on"-
75 6F 64 20 49 54 41 44 20 35 52 42  0BB9
61 72 74 20 64 72 6F 77 2D 65 6C 62  0BC5
65 74 6E 69 20 2C 73 72 65 66 73 6E  0BD1
            6E 6F 20 74 70 75 72 72  0BDD
2C 35 52 42 20 65 6E 6F 64 09 2F 21  0BE5   647                       "!/      dcne BR5, Data register checked ONLY once (after done)"
74 73 69 67 65 72 20 61 74 61 44 20  0BF1
4F 20 64 65 6B 63 65 68 63 20 72 65  0BFD
66 61 28 20 65 63 6E 6F 20 59 4C 4E  0C09
         29 65 6E 6F 64 20 72 65 74  0C15
                                 70  0BAD
                                     0C1E   648 ;----------------------------------------------------------------------------
                                     0C1E   649 T_M2_UBE_3:
20 29 44 28 30 30 30 33 09 2F 21 00' 0C1E   650             .ASCIC    "!/      3000(D) BR7 DATI single-word transfers, interrupt"-
6E 69 73 20 49 54 41 44 20 37 52 42  0C2A
61 72 74 20 64 72 6F 77 2D 65 6C 67  0C36
65 74 6E 69 20 2C 73 72 65 66 73 6E  0C42
                  74 70 75 72 72  0C4E
63 61 65 20 72 65 74 66 61 09 2F 21  0C53   651                       "!/      after each transfer, Data register checked ONLY once"-
20 2C 72 65 66 73 6E 61 72 74 20 68  0C5F
65 74 73 69 67 65 72 20 61 74 61 44  0C6B
4E 4F 20 64 65 6B 63 65 68 63 20 72  0C77
               65 63 6E 6F 20 59 4C  0C83
69 66 20 72 65 74 66 61 28 09 2F 21  0C8A   652                       "!/      (after final done)"
         29 65 6E 6F 64 20 6C 61 6E  0C96
                                 80  0C1E
                                     0C9F   653 ;----------------------------------------------------------------------------
                                     0C9F   654 T_MAPS_USED:
73 73 65 72 64 64 41 20 20 2F 21 00' 0C9F   655             .ASCIC    "!/  Address of first Map used: !XL(X)!/"
61 4D 20 74 73 72 69 66 20 66 6F 20  0CAB
28 4C 58 21 20 3A 64 65 73 75 20 70  0CB7
                     2F 21 29 58  0CC3
                                 27  0C9F
                                     0CC7   656 ;----------------------------------------------------------------------------
```

```
                                   0CC7   657 T_MAP_USED:
73 73 65 72 64 64 41 20 20 2F 21 00' 0CC7   658          .ASCIC  "!/  Address of Map used: !XL(X)"
64 65 73 75 20 70 61 4D 20 66 6F 20  0CD3
            29 58 28 4C 58 21 20 3A  0CDF
                                 1F  0CC7
                                     0CE7   659 ;-----------------------------------------------------------------------
                                     0CE7   660 T_MXFR_ERR_HDR:
72 69 66 20 65 68 54 20 20 2F 21 00' 0CE7   661          .ASCIC  "!/  The first eight (or fewer) errors are:!/"-
72 6F 28 20 74 68 67 69 65 20 74 73  0CF3
6F 72 72 65 20 29 72 65 77 65 66 20  0CFF
         2F 21 3A 65 72 61 20 73 72  0D0B
20 20 20 6E 6F 69 74 61 63 6F 4C 09  0D14   662                  "       Location    Expected      Actual          XOR!/"-
20 20 20 64 65 74 63 65 70 78 45 20  0D20
20 20 20 6C 61 75 74 63 41 20 20 20  0D2C
   2F 21 52 4F 58 20 20 20 20 20 20  0D38
20 20 20 2D 2D 2D 2D 2D 2D 2D 2D 09  0D43   663                  "       --------    --------      --------      --------!/"
20 20 20 2D 2D 2D 2D 2D 2D 2D 2D 20  0D4F
20 20 20 2D 2D 2D 2D 2D 2D 2D 2D 20  0D5B
   2F 21 2D 2D 2D 2D 2D 2D 2D 2D 20  0D67
                                 8A  0CE7
                                     0D72   664 ;-----------------------------------------------------------------------
                                     0D72   665 T_BYTE_ERR:
20 20 20 20 20 20 20 4C 58 21 09 00' 0D72   666          .ASCIC  "       !XL          !XB           !XB           !XB!/"
20 20 20 20 20 20 42 58 21 20 20 20  0D7E
20 20 20 20 20 42 58 21 20 20 20 20  0D8A
      2F 21 42 58 21 20 20 20 20 20  0D96
                                 2D  0D72
                                     0DA0   667 ;-----------------------------------------------------------------------
                                     0DA0   668 T_WORD_ERR:
20 20 20 20 20 20 20 4C 58 21 09 00' 0DA0   669          .ASCIC  "       !XL        !XW         !XW          !XW!/"
20 20 20 20 20 20 20 20 57 58 21 20  0DAC
21 20 20 20 20 20 20 20 20 57 58 21  0DB8
                        2F 21 57 58  0DC4
                                 27  0DA0
                                     0DC8   670 ;-----------------------------------------------------------------------
                                     0DC8   671 T_LONG_ERR:
4C 58 21 20 20 20 20 4C 58 21 09 00' 0DC8   672          .ASCIC  "       !XL    !XL    !XL    !XL!/"
21 20 20 20 20 4C 58 21 20 20 20 20  0DD4
                        2F 21 4C 58  0DE0
                                 1B  0DC8
                                     0DE4   673 ;-----------------------------------------------------------------------
                                     0DE4   674 T_UNX_SSYN_ERR:
65 63 65 72 20 4E 59 53 53 20 20 00' 0DE4   675          .ASCIC  "  SSYN received for invalid reference.!/"
76 6E 69 20 72 6F 66 20 64 65 76 69  0DF0
6E 65 72 65 66 65 72 20 64 69 6C 61  0DFC
                     2F 21 2E 65 63  0E08
                                 28  0DE4
                                     0E0D   676 ;-----------------------------------------------------------------------
                                     0E0D   677 T_NO_RDY_ERR:
79 64 61 65 52 20 45 42 55 20 20 00' 0E0D   678          .ASCIC  "  UBE Ready bit failed to set.  Test will abort.!/"
20 64 65 6C 69 61 66 20 74 69 62 20  0E19
73 65 54 20 20 2E 74 65 73 20 6F 74  0E25
74 72 6F 62 61 20 6C 6C 69 77 20 74  0E31
                           2F 21 2E  0E3D
                                 32  0E0D
                                     0E40   679 ;-----------------------------------------------------------------------
                                     0E40   680 T_WNG_GNT_ERR:
```

```
65 72 20 73 75 62 69 6E 55 20 20 00'  0E40   681                 .ASCIC  "  Unibus returned wrong grant or no grant.!/"
67 6E 6F 72 77 20 64 65 6E 72 75 74   0E4C
6F 6E 20 72 6F 20 74 6E 61 72 67 20   0E58
         2F 21 2E 74 6E 61 72 67 20   0E64
                                 2C   0E40
                                      0E6D   682 ;----------------------------------------------------------------
                                      0E6D   683 T_MAX_LAT_ERR:
20 61 74 61 44 20 45 42 55 20 20 00'  0E6D   684                 .ASCIC  "  UBE Data Buffer was not read within allotted time.!/"
6E 20 73 61 77 20 72 65 66 66 75 42   0E79
68 74 69 77 20 64 61 65 72 20 74 6F   0E85
20 64 65 74 74 6F 6C 6C 61 20 6E 69   0E91
               2F 21 2E 65 6D 69 74   0E9D
                                 36   0E6D
                                      0EA4   685 ;----------------------------------------------------------------
                                      0EA4   686 T_NO_SACK_ERR:
65 6C 69 61 66 20 55 50 43 20 20 00'  0EA4   687                 .ASCIC  "  CPU failed to timeout on No SACK.!/"
74 75 6F 65 6D 69 74 20 6F 74 20 64   0EB0
2E 4B 43 41 53 20 6F 4E 20 6E 6F 20   0EBC
                              2F 21   0EC8
                                 25   0EA4
                                      0ECA   688 ;----------------------------------------------------------------
                                      0ECA   689 T_NO_SSYN_ERR:
20 74 6F 6E 20 4E 59 53 53 20 20 00'  0ECA   690                 .ASCIC  "  SSYN not received within 10 usec of MSYN assertion.!/"
74 69 77 20 64 65 76 69 65 63 65 72   0ED6
20 63 65 73 75 20 30 31 20 6E 69 68   0EE2
65 73 73 61 20 4E 59 53 4D 20 66 6F   0EEE
            2F 21 2E 6E 6F 69 74 72   0EFA
                                 37   0ECA
                                      0F02   691 ;----------------------------------------------------------------
                                      0F02   692 T_WNG_A_ERR:
62 20 34 20 72 65 70 70 55 20 20 00'  0F02   693                 .ASCIC  "  Upper 4 bits of Unibus address failed to match those!/"-
75 62 69 6E 55 20 66 6F 20 73 74 69   0F0E
61 66 20 73 73 65 72 64 64 61 20 73   0F1A
63 74 61 6D 20 6F 74 20 64 65 6C 69   0F26
         2F 21 65 73 6F 68 74 20 68   0F32
61 20 45 42 55 20 65 68 74 20 66 6F   0F3B   694                                "of the UBE address./!"
         21 2F 2E 73 73 65 72 64 64   0F47
                                 4D   0F02
                                      0F50   695 ;----------------------------------------------------------------
                                      0F50   696 T_NO_GNT_ERR:
69 65 63 65 72 20 45 42 55 20 20 00'  0F50   697                 .ASCIC  "  UBE received Grant of less than 75 nsec duration or!/"-
66 6F 20 74 6E 61 72 47 20 64 65 76   0F5C
37 20 6E 61 68 74 20 73 73 65 6C 20   0F68
74 61 72 75 64 20 63 65 73 6E 20 35   0F74
            2F 21 72 6F 20 6E 6F 69   0F80
6E 6F 20 6E 61 68 74 20 65 72 6F 6D   0F88   698                                "more than one Grant.!/"
      2F 21 2E 74 6E 61 72 47 20 65   0F94
                                 4D   0F50
                                      0F9E   699 ;----------------------------------------------------------------
                                      0F9E   700 T_INT_SSYN_ERR:
65 6C 69 61 66 20 55 50 43 20 20 00'  0F9E   701                 .ASCIC  "  CPU failed to return SSYN within 3 usec after bus!/"-
20 6E 72 75 74 65 72 20 6F 74 20 64   0FAA
20 6E 69 68 74 69 77 20 4E 59 53 53   0FB6
72 65 74 66 61 20 63 65 73 75 20 33   0FC2
                  2F 21 73 75 62 20   0FCE
73 61 20 74 70 75 72 72 65 74 6E 69   0FD4   702                                "interrupt assertion.!/"
      2F 21 2E 6E 6F 69 74 72 65 73   0FE0
```

```
                                  4B  0F9E
                                      0FEA   703 ;-----------------------------------------------------------------------------
                                      0FEA   704 T_UBI_RDS_ERR:
74 63 65 72 72 6F 63 6E 55 20 20 00'  0FEA   705         .ASCIC  "  Uncorrectable ECC error during Unibus transfer.!/"
72 72 65 20 43 43 45 20 65 6C 62 61   0FF6
6E 55 20 67 6E 69 72 75 64 20 72 6F   1002
65 66 73 6E 61 72 74 20 73 75 62 69   100E
                        2F 21 2E 72   101A
                                  33  0FEA
                                      101E   706 ;-----------------------------------------------------------------------------
                                      101E   707 T_UBI_NXM_ERR:
74 61 20 73 75 62 69 6E 55 20 20 00'  101E   708         .ASCIC  "  Unibus attempted to access Non-existent Memory.!/"
61 20 6F 74 20 64 65 74 70 6D 65 74   102A
78 65 2D 6E 6F 4E 20 73 73 65 63 63   1036
72 6F 6D 65 4D 20 74 6E 65 74 73 69   1042
                        2F 21 2E 79   104E
                                  33  101E
                                      1052   709 ;-----------------------------------------------------------------------------
                                      1052   710 T_NO_NXM_ERR:
4E 20 52 53 43 20 49 42 55 20 20 00'  1052   711         .ASCIC  "  UBI CSR NXM bit did not set when expected.!/"
6E 20 64 69 64 20 74 69 62 20 4D 58   105E
20 6E 65 68 77 20 74 65 73 20 74 6F   106A
   2F 21 2E 64 65 74 63 65 70 78 65   1076
                                  2E  1052
                                      1081   712 ;-----------------------------------------------------------------------------
                                      1081   713 T_UBI_PB_ERR:
61 4D 20 73 75 62 69 6E 55 20 20 00'  1081   714         .ASCIC  "  Unibus Map Parity error occurred.!/"
72 72 65 20 79 74 69 72 61 50 20 70   108D
2E 64 65 72 72 75 63 63 6F 20 72 6F   1099
                           2F 21      10A5
                                  25  1081
                                      10A7   715 ;-----------------------------------------------------------------------------
                                      10A7   716 T_NO_PB_ERR:
50 20 52 53 43 20 49 42 55 20 20 00'  10A7   717         .ASCIC  "  UBI CSR Parity error bit did not set when expected.!/"
20 72 6F 72 72 65 20 79 74 69 72 61   10B3
20 74 6F 6E 20 64 69 64 20 74 69 62   10BF
70 78 65 20 6E 65 68 77 20 74 65 73   10CB
         2F 21 2E 64 65 74 63 65      10D7
                                  37  10A7
                                      10DF   718 ;-----------------------------------------------------------------------------
                                      10DF   719 T_UBI_WR_ERR:
74 61 20 73 75 62 69 6E 55 20 20 00'  10DF   720         .ASCIC  "  Unibus attempted a write with invalid Map Register.!/"
72 77 20 61 20 64 65 74 70 6D 65 74   10EB
76 6E 69 20 68 74 69 77 20 65 74 69   10F7
67 65 52 20 70 61 4D 20 64 69 6C 61   1103
         2F 21 2E 72 65 74 73 69      110F
                                  37  10DF
                                      1117   721 ;-----------------------------------------------------------------------------
                                      1117   722 T_NO_WR_ERR:
72 57 20 73 75 62 69 6E 55 20 20 00'  1117   723         .ASCIC  "  Unibus Write error bit did not set when expected.!/"
69 62 20 72 6F 72 72 65 20 65 74 69   1123
65 73 20 74 6F 6E 20 64 69 64 20 74   112F
63 65 70 78 65 20 6E 65 68 77 20 74   113B
               2F 21 2E 64 65 74      1147
                                  35  1117
                                      114D   724 ;-----------------------------------------------------------------------------
                                      114D   725 T_CSR_NCL_ERR:
```

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                                                                        D 15
ZZ-ENKAX-1.3     ERROR MESSAGES                                     3-AUG-1983        Fiche 2  Frame D15         Sequence 391
ENKAXH                                 VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:54:13  VAX-11 Macro V03-00         Page  19
1-3                                    ERROR MESSAGES                             3-AUG-1983 10:02:08  WRKD$0:[PAN.ENKAX]ENKAXH.MAR;76   (4)

66 20 52 53 43 20 49 42 55 20 20 00' 114D   726          .ASCIC  " UBI CSR failed to clear when read.!/"
65 6C 63 20 6F 74 20 64 65 6C 69 61  1159
64 61 65 72 20 6E 65 68 77 20 72 61  1165
                            2F 21 2E  1171
                                  26  114D
                                     1174   727 ;-----------------------------------------------------------------
                                     1174   728 T_EXP_INTR:
45 54 43 45 50 58 45 2C 20 2F 21 00' 1174   729          .ASCIC  "!/  EXPECTED: BR!XB Interrupt at Vector = 0148(X) IPL = !XB .!/"
74 6E 49 20 42 58 21 52 42 20 3A 44  1180
65 56 20 74 61 20 74 70 75 72 72 65  118C
28 38 34 31 30 20 3D 20 72 6F 74 63  1198
42 58 21 20 3D 20 4C 50 49 20 29 58  11A4
                         2F 21 2E 20  11B0
                                  3F  1174
                                     11B4   730 ;-----------------------------------------------------------------
                                     11B4   731 T_UNXP_INTR:
45 54 43 45 50 58 45 20 20 2F 21 00' 11B4   732          .ASCIC  "!/  EXPECTED: NO interrupt.  IPL = !XB .!/"
72 72 65 74 6E 69 20 4F 4E 20 3A 44  11C0
20 3D 20 4C 50 49 20 20 2E 74 70 75  11CC
               2F 21 2E 20 42 58 21  11D8
                                  2A  11B4
                                     11DF   733 ;-----------------------------------------------------------------
                                     11DF   734 T_NO_INTR:
20 20 3A 4C 41 55 54 43 41 20 20 00' 11DF   735          .ASCIC  " ACTUAL:   No Interrupt occurred.!/"
70 75 72 72 65 74 6E 49 20 6F 4E 20  11EB
21 2E 64 65 72 72 75 63 63 6F 20 74  11F7
                                  2F  1203
                                  24  11DF
                                     1204   736 ;-----------------------------------------------------------------
                                     1204   737 T_ACTL_INTR:
20 20 3A 4C 41 55 54 43 41 20 20 00' 1204   738          .ASCIC  " ACTUAL:   BR!XB Interrupt at Vector = !XW(X).!/"
72 65 74 6E 49 20 42 58 21 52 42 20  1210
74 63 65 56 20 74 61 20 74 70 75 72  121C
2E 29 58 28 57 58 21 20 3D 20 72 6F  1228
                               2F 21  1234
                                  31  1204
                                     1236   739 ;-----------------------------------------------------------------
                                     1236   740 T_MAP_ADR_ERR:
64 64 41 20 70 61 4D 20 20 2F 21 00' 1236   741          .ASCIC  "!/  Map Address   Data Encoded  Data Loaded   "-
20 61 74 61 44 20 20 20 73 73 65 72  1242
74 61 44 20 20 64 65 64 6F 63 6E 45  124E
   20 20 20 64 65 64 61 6F 4C 20 61  125A
76 65 69 72 74 65 52 20 61 74 61 44  1265   742                  "Data Retrieved  Data Decoded !/  -----------   ------------"-
63 65 44 20 61 74 61 44 20 20 64 65  1271
2D 2D 2D 20 20 2F 21 20 64 65 64 6F  127D
2D 20 20 20 2D 2D 2D 2D 2D 2D 2D 2D  1289
   2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D  1295
2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 20 20  12A0   743                  " -----------   --------------  ------------!/     !XL      "-
2D 2D 2D 2D 2D 2D 2D 2D 20 20 20 2D  12AC
2D 2D 2D 2D 20 20 2D 2D 2D 2D 2D 2D  12B8
20 20 2F 21 2D 2D 2D 2D 2D 2D 2D 2D  12C4
20 20 20 20 20 20 4C 58 21 20 20 20  12D0
4C 58 21 20 20 20 20 20 4C 58 21 20  12DC   744                  " !XL      !XL         !XL      !XL!/"
4C 58 21 20 20 20 20 20 20 20 20 20  12E8
   2F 21 4C 58 21 20 20 20 20 20 20  12F4
                                  C8  1236
                                     12FF   745 ;-----------------------------------------------------------------
                                     12FF     746 T_CHANNEL_ERR:
72 75 64 20 72 6F 72 72 45 20 20 00' 12FF     747          .ASCIC  "  Error during Channel Services call.  Test will be aborted."
20 6C 65 6E 6E 61 68 43 20 67 6E 69  130B
6C 61 63 20 73 65 63 69 76 72 65 53  1317
6C 69 77 20 74 73 65 54 20 20 2E 6C  1323
64 65 74 72 6F 62 61 20 65 62 20 6C  132F
                                  2E 133B
                                  3C 12FF
                                     133C     748 ;------------------------------------------------------------------------------------
                                     133C     749 T_IHWE:
74 73 69 78 65 2D 65 72 50 20 20 00' 133C     750          .ASCIC  "  Pre-existing adapter condition.!/"
20 72 65 74 70 61 64 61 20 67 6E 69  1348
2F 21 2E 6E 6F 69 74 69 64 6E 6F 63  1354
                                  23 133C
                                     1360     751 ;------------------------------------------------------------------------------------
                                     1360     752 T_LOGIC:
63 2F 74 65 73 20 74 69 42 20 20 00' 1360     753          .ASCIC  "  Bit set/clear failure of Interrupt Enable bit.!/"
65 72 75 6C 69 61 66 20 72 61 65 6C  136C
70 75 72 72 65 74 6E 49 20 66 6F 20  1378
74 69 62 20 65 6C 62 61 6E 45 20 74  1384
                            2F 21 2E 1390
                                  32 1360
                                     1393     754 ;------------------------------------------------------------------------------------
                                     1393     755 T_IVVECT:
76 20 64 69 6C 61 76 6E 49 20 20 00' 1393     756          .ASCIC  "  Invalid vector received.  Vector=!XW(X).!/"
76 69 65 63 65 72 20 72 6F 74 63 65  139F
3D 72 6F 74 63 65 56 20 20 2E 64 65  13AB
         2F 21 2E 29 58 28 57 58 21  13B7
                                  2C 1393
                                     13C0     757 ;------------------------------------------------------------------------------------
                                     13C0     758
                                     13C0     759
```

```
                           13C0
                           13C0  .SBTTL  ERROR REPORTING ROUTINES
                           13C0
                           13C0  ;--------------------------------------------------------------------------------
                           13C0
                           13C0  ; This extended error-reporting routine prints a header message and the follow-
                           13C0  ; ing: location, expected data, actual data, and exclusive-or of expected and
                           13C0  ; actual data for each data error found.
                           13C0
                           13C0  DATA_ERR:
                           13C0
                           13C0          $DS_BGNMESSAGE
                     0000  13C0                  .WORD   ^M<>                    ; ENTRY MASK
                           13C2
                           13C2  1$:     $DS_PRINTB_S    FORMAT=T_D_ERR_HDR      ; print header
          F4EF CF     9F   13C2                  PUSHAB  T_D_ERR_HDR
      000100E0 9F     01   FB  13C6              CALLS   #$$N, @#DS$PRINTB
                           13CD
  5A    18 AC    1C AC  CD  13CD  3$:    XORL3   ERR$_P3(AP),ERR$_P2(AP),R10     ; XOR actual and expected
                           13D3
                           13D3          $DS_PRINTB_S    FORMAT=@ERR$_P4(AP),-   ; print error description
                           13D3                          P1=ERR$_P1(AP),-        ; location
                           13D3                          P2=ERR$_P2(AP),-        ; expected
                           13D3                          P3=ERR$_P3(AP),-        ; actual
                           13D3                          P4=R10                  ; XOR
                 5A   DD   13D3                  PUSHL   R10
              1C AC   DD   13D5                  PUSHL   ERR$_P3(AP)
              18 AC   DD   13D8                  PUSHL   ERR$_P2(AP)
              14 AC   DD   13DB                  PUSHL   ERR$_P1(AP)
              20 BC   9F   13DE                  PUSHAB  @ERR$_P4(AP)
      000100E0 9F     05   FB  13E1              CALLS   #$$N, @#DS$PRINTB
                           13E8  9$:
                           13E8          $DS_ENDMESSAGE
                       04  13E8                  RET                     ; RETURN TO DIAGNOSTIC SUPERVISOR
                           13E9
                           13E9
                           13E9  ; This extended error-reporting routine is called whenever a map address bus
                           13E9  ; error is encountered using the Reed-Muller error correcting code.  It prints
                           13E9  ; the Map Address, value loaded, value retrieved, value encoded, and value
                           13E9  ; decoded.
                           13E9
                           13E9  MAP_ADR_ERR:
                           13E9
                           13E9          $DS_BGNMESSAGE
                     0000  13E9                  .WORD   ^M<>                    ; ENTRY MASK
                           13EB
  54    80000000 8F   55   9C  13EB      ROTL    R5,#1@31,R4                     ; calc map offset
     54   80000000 8F      CA  13F3      BICL2   #1@31,R4                        ; clear bit 31
     54   00F26800 8F      C0  13FA      ADDL2   #A_MAP_BGN,R4                   ; add map base
                           1401
                           1401          $DS_PRINTB_S    FORMAT=T_MAP_ADR_ERR,-  ; print error header
                           1401                          P1=R4,-                 ; map address
                           1401                          P2=R5,-                 ; value encoded
                           1401                          P3=RD_MLLR_TBL[R5],-    ; value loaded
                           1401                          P4=RETRIEVE_TBL[R5],-   ; value retrieved
                           1401                          P5=DECODE_TBL[R5]       ; decoded value
          EE71 CF45   DD   1401                  PUSHL   DECODE_TBL[R5]
          EE4C CF45   DD  1406                             PUSHL   RETRIEVE_TBL[R5]
          EE27 CF45   DD  140B                             PUSHL   RD_MLLR_TBL[R5]
                 55   DD  1410                             PUSHL   R5
                 54   DD  1412                             PUSHL   R4
            FE1E CF   9F  1414                             PUSHAB  T_MAP_ADR_ERR
      000100E0 9F  06 FB  1418                             CALLS   #$$N, @#DS$PRINTB
                          141F   806
                          141F   807           $DS_ENDMESSAGE
                 04       141F                             RET                          ; RETURN TO DIAGNOSTIC SUPERVISOR
                          1420   808
                          1420   809
                          1420   810 ; This extended error-reporting routine is called when any execution error
                          1420   811 ; occurs during a Unibus data transaction.  The status bits in the UBE CR2 are
                          1420   812 ; checked and the appropriate errors are reported.
                          1420   813
                          1420   814 XFER_ERR:
                          1420   815
                          1420   816           $DS_BGNMESSAGE
               0000       1420                             .WORD   ^M<>                 ; ENTRY MASK
                          1422   817
    42 EBD9 CF    0C  E1  1422   818           BBC     #V_DATA_ERR,W_FLAGS,10$          ; br = no data error
5A   1C AC     18 AC  CD  1428   819           XORL3   ERR$_P2(AP),ERR$_P3(AP),R10      ; load XOR
                          142E   820
                          142E   821 1$:       $DS_PRINTB_S    FORMAT=T_D_ERR_HDR       ; print header
            F483 CF   9F  142E                             PUSHAB  T_D_ERR_HDR
      000100E0 9F  01 FB  1432                             CALLS   #$$N, @#DS$PRINTB
                          1439   822
                          1439   823 2$:       $DS_PRINTB_S    FORMAT=@ERR$_P4(AP),-    ; print error description
                          1439   824                           P1=ERR$_P1(AP),-         ; location
                          1439   825                           P2=ERR$_P2(AP),-         ; expected
                          1439   826                           P3=ERR$_P3(AP),-         ; actual
                          1439   827                           P4=R10                   ; XOR
                 5A   DD  1439                             PUSHL   R10
              1C AC   DD  143B                             PUSHL   ERR$_P3(AP)
              18 AC   DD  143E                             PUSHL   ERR$_P2(AP)
              14 AC   DD  1441                             PUSHL   ERR$_P1(AP)
              20 BC   9F  1444                             PUSHAB  @ERR$_P4(AP)
      000100E0 9F  05 FB  1447                             CALLS   #$$N, @#DS$PRINTB
                          144E   828
          57   24 AC  D0  144E   829           MOVL    ERR$_P5(AP),R7                   ; load map number
       57   57     02 78  1452   830           ASHL    #2,R7,R7                         ; calc Map offset
   57   00F26800 8F   C0  1456   831           ADDL2   #A_MAP_BGN,R7                    ; add map base
                          145D   832 3$:       $DS_PRINTX_S    FORMAT=T_MAP_USED,-      ; report map used
                          145D   833                           P1=R7
                 57   DD  145D                             PUSHL   R7
            F864 CF   9F  145F                             PUSHAB  T_MAP_USED
      000100E8 9F  02 FB  1463                             CALLS   #$$N, @#DS$PRINTX
                          146A   834
        00001471'EF   16  146A   835 10$:      JSB     CSR_CHK                          ; call CSR check routine
                          1470   836           $DS_ENDMESSAGE
                 04       1470                             RET                          ; RETURN TO DIAGNOSTIC SUPERVISOR
                          1471   837
                          1471   838
                          1471   839 ; This subroutine is called by prlinks XFER_ERR and MXFR_ERR via a JSB.
                          1471   840 ; It checks Control Register 2 of the appropriate UBE (R8 = device number)
                          1471   841 ; and the UBI CSR and prints error messages accordingly.
                          1471   842
                          1471     843 CSR_CHK:                                               ; entry point for Multi-Xfrs
         57   58   04  9C 1471     844          ROTL    #4,R8,R7                              ; calc index from dev number
                          1475     845
     0B EE44 DF47  07  E0 1475     846          BBS     #V_RDY,@A_BEO_CR1[R7],4$              ; br = RDY bit set
                          147C     847          $DS_PRINTB_S    FORMAT=T_NO_RDY_ERR
            F98D CF    9F 147C                          PUSHAB  T_NO_RDY_ERR
      000100E0 9F  01  FB 1480                          CALLS   #$$N, @#DS$PRINTB
                          1487     848
     0B EE2E DF47  05  E1 1487     849 4$:      BBC     #V_WNG_GNT,@A_BEO_CR2[R7],6$          ; br = no wrong grant error
                          148E     850          $DS_PRINTB_S    FORMAT=T_WNG_GNT_ERR
            F9AE CF    9F 148E                          PUSHAB  T_WNG_GNT_ERR
      000100E0 9F  01  FB 1492                          CALLS   #$$N, @#DS$PRINTB
                          1499     851
     0B EE1C DF47  06  E1 1499     852 6$:      BBC     #V_MAX_LAT,@A_BEO_CR2[R7],8$          ; br = no max. latency error
                          14A0     853          $DS_PRINTB_S    FORMAT=T_MAX_LAT_ERR
            F9C9 CF    9F 14A0                          PUSHAB  T_MAX_LAT_ERR
      000100E0 9F  01  FB 14A4                          CALLS   #$$N, @#DS$PRINTB
                          14AB     854
     0B EE0A DF47  07  E1 14AB     855 8$:      BBC     #V_NO_SACK,@A_BEO_CR2[R7],10$         ; br = no no-SACK error
                          14B2     856          $DS_PRINTB_S    FORMAT=T_NO_SACK_ERR
            F9EE CF    9F 14B2                          PUSHAB  T_NO_SACK_ERR
      000100E0 9F  01  FB 14B6                          CALLS   #$$N, @#DS$PRINTB
                          14BD     857
     0B EDF8 DF47  08  E1 14BD     858 10$:     BBC     #V_NO_SSYN,@A_BEO_CR2[R7],12$         ; br = no no-SSYN error
                          14C4     859          $DS_PRINTB_S    FORMAT=T_NO_SSYN_ERR
            FA02 CF    9F 14C4                          PUSHAB  T_NO_SSYN_ERR
      000100E0 9F  01  FB 14C8                          CALLS   #$$N, @#DS$PRINTB
                          14CF     860
     0B EDE6 DF47  09  E1 14CF     861 12$:     BBC     #V_WNG_A,@A_BEO_CR2[R7],14$           ; br = no wrong A lines error
                          14D6     862          $DS_PRINTB_S    FORMAT=T_WNG_A_ERR
            FA28 CF    9F 14D6                          PUSHAB  T_WNG_A_ERR
      000100E0 9F  01  FB 14DA                          CALLS   #$$N, @#DS$PRINTB
                          14E1     863
     0B EDD4 DF47  0A  E1 14E1     864 14$:     BBC     #V_NO_GNT,@A_BEO_CR2[R7],16$          ; br = no no-grant error
                          14E8     865          $DS_PRINTB_S    FORMAT=T_NO_GNT_ERR
            FA64 CF    9F 14E8                          PUSHAB  T_NO_GNT_ERR
      000100E0 9F  01  FB 14EC                          CALLS   #$$N, @#DS$PRINTB
                          14F3     866
     0B EDC2 DF47  0B  E1 14F3     867 16$:     BBC     #V_INT_SSYN,@A_BEO_CR2[R7],18$        ; br = no interrupt SSYN error
                          14FA     868          $DS_PRINTB_S    FORMAT=T_INT_SSYN_ERR
            FAA0 CF    9F 14FA                          PUSHAB  T_INT_SSYN_ERR
      000100E0 9F  01  FB 14FE                          CALLS   #$$N, @#DS$PRINTB
                          1505     869
       0B EB44 CF  10  E1 1505     870 18$:     BBC     #V_UBI_NXM_ERR,L_SAVE_CSR,20$         ; br = no UBI NXM error
                          150B     871          $DS_PRINTB_S    FORMAT=T_UBI_NXM_ERR
            FB0F CF    9F 150B                          PUSHAB  T_UBI_NXM_ERR
      000100E0 9F  01  FB 150F                          CALLS   #$$N, @#DS$PRINTB
                          1516     872
       0B EB33 CF  0F  E1 1516     873 20$:     BBC     #V_UBI_PB_ERR,L_SAVE_CSR,24$          ; br = no UBI Map Parity error
                          151C     874          $DS_PRINTB_S    FORMAT=T_UBI_PB_ERR
            FB61 CF    9F 151C                          PUSHAB  T_UBI_PB_ERR
      000100E0 9F  01  FB 1520                          CALLS   #$$N, @#DS$PRINTB
                          1527     875
       0B EB22 CF  0E  E1 1527     876 24$:     BBC     #V_UBI_WR_ERR,L_SAVE_CSR,26$          ; br = no UBI write error
                          152D     877          $DS_PRINTB_S    FORMAT=T_UBI_WR_ERR
            FBAE CF    9F 152D                          PUSHAB  T_UBI_WR_ERR
      000100E0 9F  01  FB 1531                          CALLS   #$$N, @#DS$PRINTB
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                                 1538   878
        0B EB11 CF    1F    E1   1538   879 26$:     BBC     #V_UBI_RDS_ERR,L_SAVE_CSR,28$    ; br = no RDS err
                                 153E   880          $DS_PRINTB_S    FORMAT=T_UBI_RDS_ERR
              FAA8 CF    9F      153E                        PUSHAB  T_UBI_RDS_ERR
       000100E0 9F    01    FB   1542                        CALLS   #$$N, @#DS$PRINTB
                                 1549   881
                          05     1549   882 28$:     RSB                                       ; return
                                 154A   883
                                 154A   884
                                 154A   885 ; This error reporting routine is called whenever a data error is
                                 154A   886 ; found in any buffer used for the Multitransfer Test.  It prints the number
                                 154A   887 ; of words in error, and optionally (as an extended message) a description
                                 154A   888 ; of up to eight locations found to be in error.  This routine makes a nested
                                 154A   889 ; call to CSR_CHK, a routine within prlink XFER_ERR which reports any errors
                                 154A   890 ; that are detected through the UBE (CR2) or the UBI CSR.
                                 154A   891
                                 154A   892 MXFR_ERR:
                                 154A   893
                                 154A   894          $DS_BGNMESSAGE
                         0000    154A                        .WORD   ^M<>              ; ENTRY MASK
                                 154C   895
                                 154C   896          $DS_PRINTB_S    FORMAT=T_MXFR_TYPE        ; description message
              F3E9 CF    9F      154C                        PUSHAB  T_MXFR_TYPE
       000100E0 9F    01    FB   1550                        CALLS   #$$N, @#DS$PRINTB
                                 1557   897
                                 1557   898          $DS_PRINTB_S    FORMAT=@ERR$_P1(AP)       ; print description
                14 BC    9F      1557                        PUSHAB  @ERR$_P1(AP)
       000100E0 9F    01    FB   155A                        CALLS   #$$N, @#DS$PRINTB
                                 1561   899
                                 1561   900          $DS_PRINTB_S    FORMAT=T_BUFF_ADR,-       ; print buffer start address
                                 1561   901                          P1=ERR$_P2(AP)
                18 AC    DD      1561                        PUSHL   ERR$_P2(AP)
              F3EB CF    9F      1564                        PUSHAB  T_BUFF_ADR
       000100E0 9F    02    FB   1568                        CALLS   #$$N, @#DS$PRINTB
                                 156F   902
                                 156F   903          $DS_PRINTB_S    FORMAT=T_MXFR_D_ERR,-     ; report # of words in error
                                 156F   904                          P1=L_ERROR_CT             ; number of errors
              EBEC CF    DD      156F                        PUSHL   L_ERROR_CT
              F2EF CF    9F      1573                        PUSHAB  T_MXFR_D_ERR
       000100E0 9F    02    FB   1577                        CALLS   #$$N, @#DS$PRINTB
                                 157E   905          $DS_PRINTX_S    FORMAT=T_MXFR_ERR_HDR     ; print header
              F765 CF    9F      157E                        PUSHAB  T_MXFR_ERR_HDR
       000100E8 9F    01    FB   1582                        CALLS   #$$N, @#DS$PRINTX
                    52    D4     1589   906          CLRL    R2                                ; clear index
          53    EBD3 CF42  D0    158B   907 5$:      MOVL    L_ERROR_LOG[R2],R3                ; load location of error
                  53  63   B0    1591   908          MOVW    (R3),R3                           ; fetch actual data
    5A    53    EAC5 CF42  CD    1594   909          XORL3   L_EXP_DATA[R2],R3,R10             ; load XOR
                                 159B   910          $DS_PRINTX_S    FORMAT=T_WORD_ERR,-       ; print error description
                                 159B   911                          P1=L_ERROR_LOG[R2],-      ; location
                                 159B   912                          P2=L_EXP_DATA[R2],-       ; expected
                                 159B   913                          P3=R3,-                   ; actual
                                 159B   914                          P4=R10                    ; XOR
                    5A    DD     159B                        PUSHL   R10
                    53    DD     159D                        PUSHL   R3
              EABA CF42   DD     159F                        PUSHL   L_EXP_DATA[R2]
              EBBA CF42   DD     15A4                        PUSHL   L_ERROR_LOG[R2]
              F7F3 CF     9F     15A9                        PUSHAB  T_WORD_ERR
          000100E8 9F    05    FB  15AD                       CALLS    #$$N, @#DS$PRINTX
                   07    52    D1  15B4    915          CMPL    R2,#7                              ; 8 lines of data printed?
                         06    13  15B7    916          BEQL    10$                                ; br = 8 lines printed
           CC 52    EBA2 CF    F2  15B9    917          AOBLSS  L_ERROR_CT,R2,5$                   ; incr index, br = not done
                                   15BF    918
        57   EB8A CF48   02    78  15BF    919 10$:     ASHL    #2,L_INITL_MAP[R8],R7              ; calc Map offset
          57   00F26800 8F    C0  15C6    920          ADDL2   #A_MAP_BGN,R7                      ; add map base
                                   15CD    921 3$:      $DS_PRINTX_S     FORMAT=T_MAPS_USED,-      ; report map used
                                   15CD    922                           P1=R7
                         57    DD  15CD                       PUSHL    R7
                    F6CC CF    9F  15CF                       PUSHAB   T_MAPS_USED
          000100E8 9F    02    FB  15D3                       CALLS    #$$N, @#DS$PRINTX
                                   15DA    923
                    FE93 CF    16  15DA    924          JSB     CSR_CHK                            ; report errors from CSRs
                                   15DE    925
                                   15DE    926          $DS_ENDMESSAGE
                             - 04  15DE                       RET                        ; RETURN TO DIAGNOSTIC SUPERVISOR
                                   15DF    927
                                   15DF    928
                                   15DF    929 ; This extended error reporting routine is called when any error bit in the
                                   15DF    930 ; UBI CSR either does not set when expected to or does not clear when read.
                                   15DF    931 ; An error message is printed if SSYN was issued when not expected, i.e.,
                                   15DF    932 ; during any attempt to set UBI CSR error bits.
                                   15DF    933
                                   15DF    934 CSR_ERR:
                                   15DF    935
                                   15DF    936          $DS_BGNMESSAGE
                               0000  15DF                       .WORD    ^M<>                ; ENTRY MASK
                                   15E1    937
          0E EA1A CF    00    E1  15E1    938          BBC     #V_NO_CSR,W_FLAGS,5$               ; br = CSR accessible
                                   15E7    939          $DS_PRINTB_S     FORMAT=T_NO_CSR_ERR       ; report no-access error
                    F29D CF    9F  15E7                       PUSHAB   T_NO_CSR_ERR
          000100E0 9F    01    FB  15EB                       CALLS    #$$N, @#DS$PRINTB
                       0060    31  15F2    940          BRW     50$                                ; end routine
                                   15F5    941
          14 EA06 CF    07    E1  15F5    942 5$:      BBC     #V_EXP_WR_ERR,W_FLAGS,10$          ; br = WR ERR not expected
          0B EA4E CF    0E    E0  15FB    943          BBS     #V_UBI_WR_ERR,L_SAVE_CSR,7$        ; br = CSR WR ERR bit set
                                   1601    944          $DS_PRINTB_S     FORMAT=T_NO_WR_ERR        ; print "never set" message
                    FB12 CF    9F  1601                       PUSHAB   T_NO_WR_ERR
          000100E0 9F    01    FB  1605                       CALLS    #$$N, @#DS$PRINTB
                       0031    31  160C    945 7$:      BRW     40$                                ; end routine
                                   160F    946
          14 E9EC CF    09    E1  160F    947 10$:     BBC     #V_EXP_NXM_ERR,W_FLAGS,15$         ; br = NXM not expected
          0B EA34 CF    10    E0  1615    948          BBS     #V_UBI_NXM_ERR,L_SAVE_CSR,13$      ; br = CSR NXM bit set
                                   161B    949          $DS_PRINTB_S     FORMAT=T_NO_NXM_ERR       ; print "never set" message
                    FA33 CF    9F  161B                       PUSHAB   T_NO_NXM_ERR
          000100E0 9F    01    FB  161F                       CALLS    #$$N, @#DS$PRINTB
                       0017    31  1626    950 13$:     BRW     40$                                ; end routine
                                   1629    951
          11 E9D2 CF    0A    E1  1629    952 15$:     BBC     #V_EXP_PB_ERR,W_FLAGS,40$          ; br = PB ERR not expected
          0B EA1A CF    0F    E0  162F    953          BBS     #V_UBI_PB_ERR,L_SAVE_CSR,40$       ; br = CSR PB ERR bit set
                                   1635    954          $DS_PRINTB_S     FORMAT=T_NO_PB_ERR        ; print "never set" message
                    FA6E CF    9F  1635                       PUSHAB   T_NO_PB_ERR
          000100E0 9F    01    FB  1639                       CALLS    #$$N, @#DS$PRINTB
                                   1640    955
    0B EC72 DF    00000008'EF    E0  1640    956 40$:     BBS     V_NO_SSYN,@A_BEO_CR2,50$           ; br = no SSYN issued
                                   164A    957          $DS_PRINTB_S     FORMAT=T_UNX_SSYN_ERR     ; print unxp SSYN message
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                 F796 CF    9F  164A                      PUSHAB  T_UNX_SSYN_ERR
           000100E0 9F    01    FB  164E                      CALLS   #$$N, @#DS$PRINTB
                                1655    958
      00F26010 9F     8001C000 8F    D3  1655    959 50$:     BITL    #M_UBI_STS,@#A_UBI_CSR          ; did CSR clear when read?
                            0B    13  1660    960          BEQL    60$                             ; br = CSR did clear
                                1662    961          $DS_PRINTB_S    FORMAT=T_CSR_NCL_ERR     ; print ''didnt clear'' message
                 FAE7 CF    9F  1662                      PUSHAB  T_CSR_NCL_ERR
           000100E0 9F    01    FB  1666                      CALLS   #$$N, @#DS$PRINTB
                                166D    962 60$:
                                166D    963          $DS_ENDMESSAGE
                            04  166D                          RET                        ; RETURN TO DIAGNOSTIC SUPERVISOR
                                166E    964
                                166E    965
                                166E    966 ; This extended error-reporting routine is called to report any errors
                                166E    967 ; pertaining to interrupts, i.e., when an unexpected interrupt occurs or
                                166E    968 ; an expected interrupt occurs with wrong vector or at wrong IPL.
                                166E    969
                                166E    970 INTR_ERR:
                                166E    971
                                166E    972          $DS_BGNMESSAGE
                          0000  166E                          .WORD   ^M<>                   ; ENTRY MASK
                                1670    973
            16 E98B CF    01    E1  1670    974          BBC             #V_EXP_BR_INTR,W_FLAGS,3$ ; br = no interrupt expected
                                1676    975          $DS_PRINTB_S    FORMAT=T_EXP_INTR,-      ; print expected message
                                1676    976                          P1=L_BR_LVL,-
                                1676    977                          P2=L_IPL
                 EA2D CF    DD  1676                      PUSHL   L_IPL
                 EA2D CF    DD  167A                      PUSHL   L_BR_LVL
                 FAF2 CF    9F  167E                      PUSHAB  T_EXP_INTR
           000100E0 9F    03    FB  1682                      CALLS   #$$N, @#DS$PRINTB
                      000F    31  1689    978          BRW             4$                       ; br around unxp intr msg
                                168C    979
                                168C    980 3$:      $DS_PRINTB_S    FORMAT=T_UNXP_INTR,-     ; print unxp intr msg
                                168C    981                          P1=L_IPL
                 EA17 CF    DD  168C                      PUSHL   L_IPL
                 FB20 CF    9F  1690                      PUSHAB  T_UNXP_INTR
           000100E0 9F    02    FB  1694                      CALLS   #$$N, @#DS$PRINTB
                                169B    982
            0E E960 CF    03    E0  169B    983 4$:      BBS             #V_BR_INTR,W_FLAGS,5$    ; br = any interrupt occurred
                                16A1    984
                                16A1    985          $DS_PRINTB_S    FORMAT=T_NO_INTR         ; print no-interrupt message
                 FB3A CF    9F  16A1                      PUSHAB  T_NO_INTR
           000100E0 9F    01    FB  16A5                      CALLS   #$$N, @#DS$PRINTB
                      001C    31  16AC    986          BRW             10$                      ; br to end of report
                                16AF    987
   E9FA CF    03    00000000'8F    EF  16AF    988 5$:      EXTZV           #CHI$V_IPL,#3,W_UBI_STS_2,R2 ; extract actual BR level
                            52      16B9
                                16BA    989          $DS_PRINTB_S    FORMAT=T_ACTL_INTR,-     ; print actual intrpt message
                                16BA    990                          P1=R2,-
                                16BA    991                          P2=W_VECTOR
                 E9F7 CF    DD  16BA                      PUSHL   W_VECTOR
                      52    DD  16BE                      PUSHL   R2
                 FB40 CF    9F  16C0                      PUSHAB  T_ACTL_INTR
           000100E0 9F    03    FB  16C4                      CALLS   #$$N, @#DS$PRINTB
                                16CB    992 10$:
                                16CB    993          $DS_ENDMESSAGE
                            04  16CB                          RET                        ; RETURN TO DIAGNOSTIC SUPERVISOR
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                                        16CC   994
                                        16CC   995
                                        16CC   996 ; This extended error reporting routine is used to report any error encountered
                                        16CC   997 ; during execution of Channel Services functions.
                                        16CC   998
                                        16CC   999 CHANNEL_ERR:
                                        16CC  1000
                                        16CC  1001         $DS_BGNMESSAGE
                                 0000   16CC                       .WORD   ^M<>                  ; ENTRY MASK
                                        16CE  1002
          00660060 8F    E9DD CF    D1  16CE  1003         CMPL    L_UBI_STATUS,#DS$_IHWE                ; initial hware error?
                           0E    12  16D7  1004         BNEQ    3$                                    ; br = not initial hware error
                                        16D9  1005         $DS_PRINTB_S    FORMAT=T_IHWE                 ; print error description
                    FC5F CF    9F  16D9                       PUSHAB  T_IHWE
              000100E0 9F    01    FB  16DD                       CALLS   #$$N, @#DS$PRINTB
                         0033    31  16E4  1006         BRW     7$                                    ; br to return
                                        16E7  1007 3$:
          00660070 8F    E9C4 CF    D1  16E7  1008         CMPL    L_UBI_STATUS,#DS$_LOGIC               ; logic error?
                           0E    12  16F0  1009         BNEQ    5$                                    ; br = not logic error
                                        16F2  1010         $DS_PRINTB_S    FORMAT=T_LOGIC                ; print error description
                    FC6A CF    9F  16F2                       PUSHAB  T_LOGIC
              000100E0 9F    01    FB  16F6                       CALLS   #$$N, @#DS$PRINTB
                         001A    31  16FD  1011         BRW     7$                                    ; br to return
                                        1700  1012 5$:
          00660038 8F    E9AB CF    D1  1700  1013         CMPL    L_UBI_STATUS,#DS$_IVVECT              ; invalid vector error?
                           0F    12  1709  1014         BNEQ    7$                                    ; br = not invalid vector error
                                        170B  1015         $DS_PRINTB_S    FORMAT=T_IVVECT,-             ; print error description
                                        170B  1016                         P1=W_VECTOR                   ; vector received
                    E9A6 CF    DD  170B                       PUSHL   W_VECTOR
                    FC80 CF    9F  170F                       PUSHAB  T_IVVECT
              000100E0 9F    02    FB  1713                       CALLS   #$$N, @#DS$PRINTB
                                        171A  1017 7$:
                                        171A  1018         $DS_ENDMESSAGE
                                   04   171A                       RET                           ; RETURN TO DIAGNOSTIC SUPERVISOR
                                        171B  1019
                                        171B  1020 ; This extended error-reporting routine is called when access to a selected
                                        171B  1021 ; UBE fails during the first multitransfer subtest to report the address
                                        171B  1022 ; of the attempted access.
                                        171B  1023
                                        171B  1024 NO_ACCESS:
                                        171B  1025
                                        171B  1026         $DS_BGNMESSAGE
                                 0000   171B                       .WORD   ^M<>                  ; ENTRY MASK
                                        171D  1027
                                        171D  1028         $DS_PRINTB_S    FORMAT=T_UBE_ADR,-         ; report address
                                        171D  1029                         P1=ERR$_P1(AP),-
                                        171D  1030                         P2=ERR$_P1(AP)
                       14 AC    DD  171D                       PUSHL   ERR$_P1(AP)
                       14 AC    DD  1720                       PUSHL   ERR$_P1(AP)
                    ECBE CF    9F  1723                       PUSHAB  T_UBE_ADR
              000100E0 9F    03    FB  1727                       CALLS   #$$N, @#DS$PRINTB
                                        172E  1031
                                        172E  1032         $DS_ENDMESSAGE
                                   04   172E                       RET                           ; RETURN TO DIAGNOSTIC SUPERVISOR
                                        172F  1033
                                 172F  .SBTTL  SUBROUTINES
                                 172F
                                 172F  ; This subroutine is called to generate the Reed-Muller encoded data which
                                 172F  ; will be used in the Map Address Bus subtest.  The data table will be created
                                 172F  ; by multiplying CODEVECTORS[I] by bit I of the number to be encoded and sum-
                                 172F  ; ming (binarily) the products.  The words thus created will be expanded into
                                 172F  ; longwords by inserting zeroes in the non-writable bit positions of the Map
                                 172F  ; Entries.  The numbers 0 - 7 will be encoded.  A more complete explanation of
                                 172F  ; this encoding scheme appears in the Map Address Bus subtest description.
                                 172F
                                 172F  RD_MLLR_ENCODE:
                                 172F
                     54     D4   172F              CLRL     R4                              ; clear input number
                     52     D4   1731  1$:         CLRL     R2                              ; clear temp location
                     51     D4   1733              CLRL     R1                              ; clear vector index (I)
     53   54    01   51     EF   1735  2$:         EXTZV    R1,#1,R4,R3                     ; extract bit I from input
       53   EB58 CF41       A4   173A              MULW2    CODEVECTORS[R1],R3              ; multiply bit by vector
          52    52   53     CD   1740              XORL3    R3,R2,R2                        ; binary sum
              ED 51  03     F3   1744              AOBLEQ   #3,R1,2$                        ; br = not last vector
              07 52  0F     E5   1748              BBCC     #15,R2,3$                       ; br = bit 15 clear and clear
     52    02000000  8F     C8   174C              BISL2    #M_BYTE_OFF,R2                  ; set bit 25 (byte-offset bit)
        EADE CF44    52     D0   1753  3$:         MOVL     R2,RD_MLLR_TBL[R4]              ; load into table
              D4 54  07     F3   1759              AOBLEQ   #7,R4,1$                        ; do until 0-7 are encoded
                            05   175D              RSB                                      ; return to mainline code
                                 175E
                                 175E
                                 175E  ; This subroutine is called to decode the data retrieved from the Map Entries
                                 175E  ; during the Map Address Bus subtest and loads it into DECODE_TBL.  A brief
                                 175E  ; explanation of this decoding scheme appears in the subtest description.
                                 175E
                                 175E  RD_MLLR_DECODE:
                                 175E
                                 175E  ; Decode 3 MSBs  of the information nibble first.
                                 175E
                     52     D4   175E              CLRL     R2                              ; clear index
             EB12 CF42      D4   1760  0$:         CLRL     DECODE_TBL[R2]                  ; clear decoded word
   EA36 CF   EAED CF42      D0   1765              MOVL     RETRIEVE_TBL[R2],L_RETRIEVE ; get retrieved word
       09 EA31 CF    19     E5   176D              BBCC     #V_BYTE_OFF,L_RETRIEVE,1$ ; br = byte-offset bit clr, clr
  EA27 CF    00008000 8F    C8   1773              BISL2    #<1@15>,L_RETRIEVE              ; set bit 15 of retrieved word
          EA0E CF    01     D0   177C  1$:         MOVL     #1,L_PAIR_SEP                   ; pair separation = 1
          EA05 CF    01     D0   1781              MOVL     #1,L_INFO_BIT                   ; info bit position = 1
                EA15 CF     D4   1786  2$:         CLRL     L_POP                           ; clear ones population
          01    E9FD CF     D1   178A              CMPL     L_INFO_BIT,#1                   ; first iteration ?
                     08     13   178F              BEQL     3$                              ; br = first iteration
  E9F6 CF   E9F9 CF  01     78   1791              ASHL     #1,L_PAIR_SEP,L_PAIR_SEP ; double separation
          E9F5 CF    0F     D0   1799  3$:         MOVL     #15,L_POSITION                  ; load bit position
  E9FD CF   01   E9F1 CF    EF   179E  4$:         EXTZV    L_POSITION,#1,L_RETRIEVE,L_TEMP_A ; first bit of relation
                 E9EE CF         17A6
     E9E3 CF     E9E2 CF    C2   17A9              SUBL2    L_PAIR_SEP,L_POSITION           ; point to other bit of relation
  E9EB CF   01   E9DF CF    EF   17B0              EXTZV    L_POSITION,#1,L_RETRIEVE,L_TEMP_B ; second bit of relation
                 E9E0 CF         17B8
     E9D5 CF     E9DC CF    CC   17BB              XORL2    L_TEMP_B,L_TEMP_A               ; XOR redundant relation bits
     E9D6 CF     E9D1 CF    C0   17C2              ADDL2    L_TEMP_A,L_POP                  ; incr ones population if XOR = 1
     59     01   E9BE CF    78   17C9              ASHL     L_INFO_BIT,#1,R9                ; 2**L_INFO_BIT
  7E     00   E9BF CF  01   7A   17CF              EMUL     #1,L_POSITION,#0,-(SP)          ; extend position to quadword
     5A     5A    8E   59   7B   17D6              EDIV     R9,(SP)+,R10,R10                ; R10 = L_POSITION mod (2**L_INFO_BIT)
                     5A     D5   17DB              TSTL     R10                             ; R10 clear?
```

```
                        07   13  17DD  1090          BEQL    10$                          ; br = R10 clear
        E9AD CF    E9AC CF   C0  17DF  1091          ADDL2   L_PAIR_SEP,L_POSITION        ; restore position
              B3 E9A9 CF     F4  17E6  1092 10$:     SOBGEQ  L_POSITION,4$                ; decr position, br >= 0
          04    E9B0 CF      D1  17EB  1093          CMPL    L_POP,#4                     ; is decoded bit 0?
                        06   19  17F0  1094          BLSS    11$                          ; br = decoded bit 0?
           EA7F CF42    59   C8  17F2  1095          BISL2   R9,DECODE_TBL[R2]            ; set info bit in decoded word
        88 E98E CF      03   F3  17F8  1096 11$:     AOBLEQ  #3,L_INFO_BIT,2$             ; incr info bit, br = not done
                                 17FE  1097
                                 17FE  1098 ; Decode LSB, using the previously-decoded 3 MSBs of the information nibble.
                                 17FE  1099
                   53   01   D0  17FE  1100 12$:     MOVL    #1,R3                        ; info bit pointer = 1
       E992 CF    EA71 CF42  D0  1801  1101          MOVL    DECODE_TBL[R2],L_TEMP_B      ; load partially-decoded word
  E985 CF    E98C CF   01 53 EF  1809  1102 13$:     EXTZV   R3,#1,L_TEMP_B,L_TEMP_A      ; extr info bit from decoded word
       E97D CF    EA80 CF43  A4  1812  1103          MULW2   CODEVECTORS[R3],L_TEMP_A     ; multiply info bit by codevector
        E982 CF    E979 CF   AC  181A  1104          XORW2   L_TEMP_A,L_RETRIEVE          ; XOR result with retrieved word
               E4 53    03   F3  1821  1105          AOBLEQ  #3,R3,13$                    ; incr info bit pointer, br = not done
                  E976 CF    D4  1825  1106          CLRL    L_POP                        ; clear ones population
                        53   D4  1829  1107          CLRL    R3                           ; clear bit pointer
        04 E973 CF      53   E1  182B  1108 14$:     BBC     R3,L_RETRIEVE,15$            ; br = XOR bit clear
                  E96A CF    D6  1831  1109          INCL    L_POP                        ; incr ones population
               F2 53    0F   F3  1835  1110 15$:     AOBLEQ  #15,R3,14$                   ; incr pointer, br = not done
          08    E962 CF      D1  1839  1111          CMPL    L_POP,#8                     ; determine info bit 0
                        05   19  183E  1112          BLSS    16$                          ; br = info bit 0 will be 0
              EA32 CF42      D6  1840  1113          INCL    DECODE_TBL[R2]               ; set bit 0
                        52   D6  1845  1114 16$:     INCL    R2                           ; incr index
                   07   52   D1  1847  1115          CMPL    R2,#7                        ; done?
                        03   14  184A  1116          BGTR    17$                          ; br = done
                      FF11   31  184C  1117          BRW     0$                           ; br = beginning of loop
                                 184F  1118 17$:
                             05  184F  1119          RSB
                                 1850  1120
                                 1850  1121
                                 1850  1122 ; This subroutine is used to set up a UBE operation.  The five UBE registers
                                 1850  1123 ; of the specified UBE are loaded with the command specified.  This routine
                                 1850  1124 ; contains a rather unconventional use of index mode in which an index is
                                 1850  1125 ; used to add the appropriate offset in order to load into the desired device.
                                 1850  1126 ; This index is not incremented during this subroutine.  The following
                                 1850  1127 ; parameters are expected to be loaded before calling this routine:
                                 1850  1128 ;
                                 1850  1129 ;        R8      UBE device number (0-3)
                                 1850  1130 ;        R9      address of command table for desired function
                                 1850  1131
                                 1850  1132
                                 1850  1133 UBE_SET_UP:
                                 1850  1134
          5A    EA57 CF      DE  1850  1135          MOVAL   A_UBE_ADR_TBL,R10            ; load adr of UBE Reg adr table
          51    58      03   78  1855  1136          ASHL    #3,R8,R1                     ; calc word index from device number
              9A41      89   B0  1859  1137 1$:      MOVW    (R9)+,@(R10)+[R1]            ; load UBE register
      000002BF'8F       5A   D1  185D  1138          CMPL    R10,#A_BE0_CR1               ; all registers loaded ?
                        F3   15  1864  1139          BLEQ    1$                           ; br = not all registers loaded
                             05  1866  1140          RSB                                  ; return to mainline code
                                 1867  1141
                                 1867  1142
                                 1867  1143 ; This routine sizes Unibus Memory space from Unibus address 0 through
                                 1867  1144 ; 777000 (octal) in increments of 512 byte addresses.  A bitvector is gener-
                                 1867  1145 ; ated (V_VALID_MAPS) with a bit set for each valid map entry (those for which
                                 1867  1146 ; Unibus memory has not been implemented).  The bitvector is initially all
```

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                                     1867  1147 ; ones and bits are cleared in this routine each time a Unibus address is suc-
                                     1867  1148 ; cessfully accessed.  The Valid bit is set in each Map Entry which is found to
                                     1867  1149 ; be usable and cleared otherwise.  The Number of the first valid Map Entry is
                                     1867  1150 ; returned in the location FRST_VAL_MAP.  If there are no valid maps this loca-
                                     1867  1151 ; tion will retain its initial value of -1.
                                     1867  1152
                                     1867  1153 UNIBUS_SIZER:
                                     1867  1154
                                     1867  1155
                                     1867  1156
                                     1867  1157 ;
                                     1867  1158 ; Clear vector bits representing invalid Map Entries due to the presence of
                                     1867  1159 ; any Unibus devices.
                                     1867  1160 ;
                                     1867  1161
                                     1867  1162         $DS_SETVEC_S    #SCB$L_MACHCHK,200$      ;set machine check handler
                        00      DD   1867                       PUSHL   #0
              000018E8'EF       DF   1869                       PUSHAL  200$
                        04      DD   186F                       PUSHL   #SCB$L_MACHCHK
        00010160 9F     03      FB   1871                       CALLS   #3, @#DS$SETVEC
                        52      D4   1878  1163         CLRL    R2                               ; initialize counter
                        54      7C   187A  1164         CLRQ    R4                               ;  clear indices
      53    00FC0000 8F         D0   187C  1165         MOVL    #A_UB_IO_SP,R3                   ; load adress of I/O space into R3
            50    6345          B0   1883  1166 1$:     MOVW    (R3)[R5],R0                      ; attempt access of memory
                                     1887  1167
 E778 CF    01     54   00      F0   1887  1168         INSV    #0,R4,#1,V_VALID_MAPS            ; clear vector bit if device response
                        0F      11   188E  1169         BRB     6$                               ; br out of loop
 E76F CF    01     54   01      F0   1890  1170 5$:     INSV    #1,R4,#1,V_VALID_MAPS            ; set nector bit if no device respone
    E4 55   0000007F 8F         F3   1897  1171         AOBLEQ  #127,R5,1$                       ; incr index, br = not end of page
                        55      D4   189F  1172 6$:     CLRL    R5                               ; clear index
            09 52       32      F3   18A1  1173         AOBLEQ  #50,R2,30$                       ; limit calls $DS_BREAK
                        52      D4   18A5  1174         CLRL    R2                               ; reset counter
                                     18A7  1175         $DS_BREAK                                ; check for ^C
        00010058 9F     6E      FA   18A7                       CALLG   (SP), @#DS$BREAK
      53    00000200 8F         C0   18AE  1176 30$:    ADDL2   #512,R3                          ; adjust R3 to next page boundary
    C6 54   00000200 8F         F2   18B5  1177         AOBLSS  #512,R4,1$                       ; incr page no and br = not done
                                     18BD  1178 ;
                                     18BD  1179 ; Find first valid Map Entry.
                                     18BD  1180 ;
 E73C CF    FFFFFFFF 8F         D0   18BD  1181         MOVL    #-1,FRST_VAL_MAP                 ; load no-valid-map value
                        54      D4   18C6  1182         CLRL    R4                               ; clear position
       07 E739 CF       54      E1   18C8  1183 7$:     BBC     R4,V_VALID_MAPS,8$               ; br = valid bit found
          E72F CF       54      D0   18CE  1184         MOVL    R4,FRST_VAL_MAP                  ; load number of first valid Map Entry
                        08      11   18D3  1185         BRB     9$                               ; br out of loop
    EB 54   00000200 8F         F2   18D5  1186 8$:     AOBLSS  #512,R4,7$                       ; incr pos, br = not done
                                     18DD  1187 9$:
                                     18DD  1188
                                     18DD  1189         $DS_CLRVEC_S    #SCB$L_MACHCHK   ; restore machine check handler
                        04      DD   18DD                       PUSHL   #SCB$L_MACHCHK
        00010168 9F     01      FB   18DF                       CALLS   #1, @#DS$CLRVEC
                                05   18E6  1190         RSB                                      ; return to mainline code
                                     18E7  1191
                                     18E7  1192 ; This routine services machine check
                                     18E7  1193
                                     18E7  1194         .ALIGN  LONG                             ; machine check handler
                                     18E8  1195
                                     18E8  1196 200$:
```

```
  00000000'8F   FFFFFFFF 8F   DA  18E8           MTPR    #-1,#PR$_MCESR                 ; clear any error
                     5E  8E   C0  18F3           ADDL    (SP)+,SP                       ; reset SP
              6E     97  AF   9E  18F6           MOVAB   5$,(SP)                        ; set return address
                              02  18FA           REI                                    ; return
                                  18FB
                                  18FB
                                  18FB      ; This subroutine is used to invalidate all Map Entries.
                                  18FB
                                  18FB      INVAL_MAPS:
                                  18FB
                         54   D4  18FB           CLRL    R4                             ; clear index
              00F26800 9F44   D4  18FD      1$:  CLRL    @#A_MAP_BGN[R4]                ; clear Map Entry
         F1 54  00000200 8F   F2  1904           AOBLSS  #512,R4,1$                     ; incr index, br = not done
                              05  190C           RSB                                    ; return to mainline code
                                  190D
                                  190D
                                  190D      ; This subroutine sets the valid bit in each usable Map Entry.
                                  190D
                                  190D      VAL_MAPS:
                                  190D
                         54   D4  190D           CLRL    R4                             ; clear index
          0C E6F2 CF     54   E1  190F      1$:  BBC     R4,V_VALID_MAPS,3$             ; br = Map Invalid
00F26800 9F44   80000000 8F   C8  1915           BISL2   #M_MAP_VAL,@#A_MAP_BGN[R4] ; validate Map Entry
         E6 54  00000200 8F   F2  1921      3$:  AOBLSS  #512,R4,1$                     ; incr index, br = not done
                              05  1929           RSB                                    ; return to mainline code
                                  192A
                                  192A
                                  192A      ; This subroutine sets up all valid Map Entries to point to the page number
                                  192A      ; passed in the location L_PAGE_NO.
                                  192A
                                  192A      ALL_MAPS:
                                  192A
  59    E717 CF   80000000 8F   C9  192A           BISL3   #M_MAP_VAL,L_PAGE_NO,R9 ; load data to put in Map Entries
                         54   D4  1934           CLRL    R4                             ; clear index
          08 E6CB CF     54   E1  1936      1$:  BBC     R4,V_VALID_MAPS,3$             ; br = Map Invalid
        00F26800 9F44    59   D0  193C           MOVL    R9,@#A_MAP_BGN[R4]             ; load Map Entry
         EA 54  00000200 8F   F2  1944      3$:  AOBLSS  #512,R4,1$                     ; incr index, br = not done
                              05  194C           RSB                                    ; return to mainline code
                                  194D
                                  194D
                                  194D      ; This subroutine is called during the Multi-transfer test to set up a
                                  194D      ; sequence of contiguous maps as described by the following parameters:
                                  194D      ;
                                  194D      ;            L_BUFFER_ADR     starting address of buffer
                                  194D      ;            L_MAPS_NEEDED    number of contiguous maps needed
                                  194D      ;            L_MAP_NUM        next map number to try
                                  194D      ;            W_FLAGS          bit (M_BO) set to indicate byte-offset mode
                                  194D      ;
                                  194D      ;            R0               lsb set if successful
                                  194D
                                  194D      SET_UP_MAPS:
                                  194D
                         50   D4  194D           CLRL    R0                                     ; clear success code
                         52   D4  194F           CLRL    R2                                     ; clear index
              51    E735 CF   D0  1951           MOVL    L_MAP_NUM,R1                           ; load next Map Number
E6EB CF   E76B CF    0F  09   EF  1956           EXTZV   #9,#15,L_BUFFER_ADR,L_PAGE_NO          ; extract page number
                                  195F      ;
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```
                                   195F   1254 ; Find next block of usable maps, set up Map Entries
                                   195F   1255 ;
      E69F CF     E73F CF    51  EC  195F   1256 1$:        CMPV    R1,L_MAPS_NEEDED,V_VALID_MAPS,#-1 ; block usable?
                   FFFFFFFF 8F      1967
                             0B  13  196C   1257            BEQL    3$                                ; br = not usable
           E9 51    00000200 8F  F2  196E   1258            AOBLSS  #512,R1,1$                        ; incr index br = not done
                           003B  31  1976   1259            BRW     10$                               ; br = maps used up
                             50  D6  1979   1260 3$:        INCL    R0                                ; set success code
               E7CE CF48     51  D0  197B   1261            MOVL    R1,L_INITL_MAP[R8]                ; save initial map number
       00F26800 9F41    E6C5 CF  D0  1981   1262 4$:        MOVL    L_PAGE_NO,@#A_MAP_BGN[R1]         ; load PFN into Map Entry
                        E6BB CF  B6  198B   1263            INCW    L_PAGE_NO                         ; increment page number
   00F26800 9F41    80000000 8F  C8  198F   1264            BISL2   #M_MAP_VAL,@#A_MAP_BGN[R1]        ; set valid bit
   00F26800 9F41    02000000 8F  C8  199B   1265            BISL2   #M_BYTE_OFF,@#A_MAP_BGN[R1]       ; set byte-offset bit
                             51  D6  19A7   1266 5$:        INCL    R1                                ; incr index
             D2 52    E6F6 CF  F2  19A9   1267            AOBLSS  L_MAPS_NEEDED,R2,4$               ; incr count, br = not done
                E6D6 CF      51  D0  19AF   1268            MOVL    R1,L_MAP_NUM                      ; update map number
                                     19B4   1269 10$:
                             05      19B4   1270            RSB                                       ; return to mainline code
                                     19B5   1271
                                     19B5   1272
                                     19B5   1273 ; This subroutine is called during the Multi-transfer test to load up a
                                     19B5   1274 ; buffer as described by the following parameters:
                                     19B5   1275 ;
                                     19B5   1276 ;          L_BUFFER_ADR    starting address of buffer
                                     19B5   1277 ;          L_BUFFER_SIZE   size of buffer (in words)
                                     19B5   1278 ;          L_PTRNS[R8]     pattern to be loaded in each location
                                     19B5   1279
                                     19B5   1280 LOAD_BUFFER:
                                     19B5   1281
                             52  D4  19B5   1282            CLRL    R2                                ; clear index
            53    E6D6 CF48  D0  19B7   1283            MOVL    L_PTRNS[R8],R3                    ; load pattern
           E704 DF42         53  B0  19BD   1284 1$:        MOVW    R3,@L_BUFFER_ADR[R2]              ; load pattern into buffer
          F4 52      E744 CF  F3  19C3   1285            AOBLEQ  L_BUFFER_SIZE,R2,1$               ; incr index, br = not done
                             05      19C9   1286            RSB
                                     19CA   1287
                                     19CA   1288
                                     19CA   1289 ; This subroutine compares the contents of the buffer as described below to
                                     19CA   1290 ; the expected data pattern.  LSB of R0 is set if no errors are found.  The
                                     19CA   1291 ; first ten errors found are logged in the error buffer.
                                     19CA   1292 ;
                                     19CA   1293 ;          L_EXP_DATA      expected pattern
                                     19CA   1294 ;          L_BUFFER_ADR    starting address of buffer
                                     19CA   1295 ;          L_BUFFER_SIZE   size (in words) of buffer
                                     19CA   1296
                                     19CA   1297 CHECK_BUFFER:
                                     19CA   1298
                             50  7C  19CA   1299            CLRQ    R0                                ; clear success code, index
                             54  D4  19CC   1300            CLRL    R4                                ; clear index
      E6F1 DF44      E68C CF  B1  19CE   1301 1$:        CMPW    L_EXP_DATA,@L_BUFFER_ADR[R4]      ; check data
                             18  13  19D6   1302            BEQL    5$                                ; br = ok
                    0A       51  D1  19D8   1303            CMPL    R1,#10                            ; 10 errors logged?
                             11  18  19DB   1304            BGEQ    3$                                ; br = 10 errors logged
    E77D CF41    E6E5 DF44  3E  19DD   1305            MOVAW   @L_BUFFER_ADR[R4],L_ERROR_LOG[R1] ; save location of error
    E670 CF41       E674 CF  D0  19E6   1306            MOVL    L_EXP_DATA,L_EXP_DATA[R1]         ; save expected data
                             51  D6  19EE   1307 3$:        INCL    R1                                ; incr error count
          D8 54      E717 CF  F2  19F0   1308 5$:        AOBLSS  L_BUFFER_SIZE,R4,1$               ; incr index, br = not done
              E764 CF        51  D0  19F6   1309            MOVL    R1,L_ERROR_CT                     ; save error count
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                         02    12  19FB  1310          BNEQ    7$                               ; br = any errors
                         50    D6  19FD  1311          INCL    R0                               ; set success code
                               05  19FF  1312 7$:      RSB                                      ; return to mainline code
                                   1A00  1313
                                   1A00  1314
                                   1A00  1315 ; This subroutine compares the contents of the buffer as described below to
                                   1A00  1316 ; the data expected for Multitransfer 1, UBE 0 (data from Cycle Count register).
                                   1A00  1317 ; The first eight errors found are logged in the error buffers.
                                   1A00  1318 ;
                                   1A00  1319 ;        L_BUFFER_ADR     starting address of buffer
                                   1A00  1320 ;        L_BUFFER_SIZE    size (in words) of buffer
                                   1A00  1321
                                   1A00  1322 CHECK_BJF_0:
                                   1A00  1323
                         50    7C  1A00  1324          CLRQ    R0                               ; clear success code, index
                         54    D4  1A02  1325          CLRL    R4                               ; clear index
               53   F830 8F    B0  1A04  1326          MOVW    #-2000,R3                        ; load expected data
         E6B8 DF44       53    B1  1A09  1327 1$:      CMPW    R3,@L_BUFFER_ADR[R4]             ; check data
                         16    13  1A0F  1328          BEQL    5$                               ; br = ok
                    08   51    D1  1A11  1329          CMPL    R1,#8                            ; 8 errors logged?
                         0F    18  1A14  1330          BGEQ    3$                               ; br = 8 errors logged
     E744 CF41    E6AC DF44    3E  1A16  1331          MOVAW   @L_BUFFER_ADR[R4],L_ERROR_LOG[R1] ; save location of error
          E639 CF41      53    D0  1A1F  1332          MOVL    R3,L_EXP_DA1A[R1]                ; save expected data
                         51    D6  1A25  1333 3$:      INCL    R1                               ; incr error count
                    53   02    C0  1A27  1334 5$:      ADDL2   #2,R3                            ; incr expected data
        D9 54    E6DD CF       F2  1A2A  1335          AOBLSS  L_BUFFER_SIZE,R4,1$              ; incr index, br = not done
          E72A CF        51    D0  1A30  1336          MOVL    R1,L_ERROR_CT                    ; save error count
                         02    12  1A35  1337          BNEQ    7$                               ; br = any errors
                         50    D6  1A37  1338          INCL    R0                               ; set success code
                               05  1A39  1339 7$:      RSB                                      ; return to mainline code
                                   1A3A  1340
                                   1A3A  1341
                                   1A3A  1342 ;
                                   1A3A  1343 ; This routine services interrupts generated by UBE 0 in the Interrupt subtest
                                   1A3A  1344 ; only.
                                   1A3A  1345 ;
                                   1A3A  1346          .ALIGN  LONG
                                   1A3C  1347
                                   1A3C  1348 BR_SERVICE:
                                   1A3C  1349
                                   1A3C  1350          $DS_CANWAIT_S                            ; cancel wait
         00010070 9F     00    FB  1A3C                        CALLS   #0, @#DS$CANWAIT
            E5B8 CF      08    A8  1A43  1351          BISW2   #M_BR_INTR,W_FLAGS               ; set interrupt flag
      E666 CF     0148 8F      B1  1A48  1352          CMPW    #^X148,W_VECTOR                  ; check vector
                         05    13  1A4F  1353          BEQL    3$                               ; br = correct vector
            E5AA CF      10    A8  1A51  1354          BISW2   #M_INTR_ERR,W_FLAGS              ; set interrupt error flag
  E653 CF    03    00000000'8F     ED  1A56  1355 3$:      CMPZV   #CHI$V_IPL,#3,W_UBI_STS_2,L_BR_LVL ; check BR level
               E648 CF             1A60
                         05    13  1A63  1356          BEQL    5$                               ; br = correct level
            E596 CF      10    A8  1A65  1357          BISW2   #M_INTR_ERR,W_FLAGS              ; set interrupt error flag
                                   1A6A  1358 5$:
                               02  1A6A  1359          REI                                      ; return
                                   1A6B  1360
                                   1A6B  1361
                                   1A6B  1362 ;
                                   1A6B  1363 ; This interrupt service routine services any BR interrupts generated during
                                   1A6B  1364 ; Functional Test except those generated in the Interrupt subtest.
```

```
                              1A6B  1365 ;
                              1A6B  1366          .ALIGN  LONG
                              1A6C  1367
                              1A6C  1368 INTR_SERVICE:
                              1A6C  1369
                              1A6C  1370          $DS_CANWAIT_S                               ; cancel wait
        00010070 9F    00  FB 1A6C                        CALLS   #0, @#DS$CANWAIT
                           02 1A73  1371          REI                                         ; return
                              1A74  1372
                              1A74  1373
                              1A74  1374 ; This interrupt-service routine is entered during the Multi-transfer test
                              1A74  1375 ; when UBE 0 has stopped transferring data.
                              1A74  1376
                              1A74  1377          .ALIGN  LONG
                              1A74  1378
                              1A74  1379 BE0_SERVICE:
                              1A74  1380
                 E62A CF   96 1A74  1381          INCB    B_DONE_CT                           ; incr done count
                           02 1A78  1382          REI                                         ; return to mainline code
                              1A79  1383
                              1A79  1384
                              1A79  1385 ; This interrupt-service routine is entered during the Multi-transfer test
                              1A79  1386 ; when UBE 3 has stopped transferring data.  This routine sets up UBE 3
                              1A79  1387 ; to execute another data transfer until it has transferred 3000 words.
                              1A79  1388
                              1A79  1389          .ALIGN  LONG
                              1A7C  1390
                              1A7C  1391 BE3_SERVICE:
                              1A7C  1392
                 E637 CF   D6 1A7C  1393          INCL    L_XFR_COUNT                         ; increment count
      00000BB8 8F   E633 CF   D1 1A80  1394          CMPL    L_XFR_COUNT,#3000                   ; 3000 transfers?
                      11   13 1A89  1395          BEQL    5$                                  ; br = 3000 transfers
        E831 DF    FFFF 8F  B0 1A8B  1396          MOVW    #-1,@A_BE3_CC                       ; load cycle count
        E82E DF    04D1 8F  B0 1A92  1397          MOVW    #<M_RDY!M_BR7!M_DATI!M_ONE_XFR!M_INT_ODNE!M_GO>,@A_BE3_CR1 ; CR1
                    0004   31 1A99  1398          BRW     10$                                 ; br to return
                 E602 CF   96 1A9C  1399 5$:      INCB    B_DONE_CT                           ; incr done count
                           02 1AA0  1400 10$:     REI                                         ; return to mainline code
                              1AA1  1401
                              1AA1  1402
                              1AA1  1403 ; This interrupt-service routine is used to set TIMEOUT flag in the event of
                              1AA1  1404 ; of an interval timer timeout.
                              1AA1  1405
                              1AA1  1406          .ALIGN  LONG
                              1AA4  1407
                              1AA4  1408 TIMER_SERVICE:
                              1AA4  1409
   00000000'8F    80000080 8F  DA 1AA4  1410          MTPR    #<M_CLK_ERR+M_CLK_INTR>,#PR$_ICCS ; stop clock
          E54C CF    04    A8 1AAF  1411          BISW2   #M_TIMEOUT,W_FLAGS                  ; set timeout flag
                           02 1AB4  1412          REI                                         ; return to mainline code
                              1AB5  1413
                              1AB5  1414
                              1AB5  1415          $DS_PAGE
```

```
                          1AB5                .SBTTL  TEST 8:  UNIBUS Functional Test
                      00000000                        .PSECT  TEST_008, PAGE, NOWRT
                          001C
                          001C  1418 ;++
                          001C  1419 ; Test description:
                          001C  1420 ;
                          001C  1421 ;          This test will be implemented to run using a Unibus Exerciser (UBE).
                          001C  1422 ;          This test checks the UBI CSR, MAP's and various data transactions
                          001C  1423 ;          using a Unibus Exerciser. The UBE must be set up at address 770000 (Oc-
                          001C  1424 ;          tal) with vector 510 (Octal).
                          001C  1425 ;
                          001C  1426 ;--
                          001C  1427
                          001C  1428          $DS_BGNTEST     <DEFAULT,UBI,ALL>
                          001C       DATA_008:
              00000000    001C                        .LONG   0                 ; TEST ARGUMENT TABLE TERMINATOR
                          0020       TEST_008::
                  0000    0020                        .WORD   ^M<>              ; ENTRY MASK
                          0022  1429
         00000000'EF  D5  0022  1430          TSTL            BEO_UNIT_NO                         ; BEO selected?
                  10  18  0028  1431          BGEQ            0$                                  ; br = BEO selected
                          002A  1432          $DS_PRINTF_S    FORMAT=T_NO_BEO                     ; print exit warning
         00000397'EF  9F  002A                        PUSHAB  T_NO_BEO
      000100F0 9F 01  FB  0030                        CALLS   #$$N, @#DS$PRINTF
                          0037  1433          $DS_EXIT        TEST                                ; exit test
                195E  31  0037                        BRW     TEST_008_X        ; EXIT TEST 8
                          003A  1434
                  58  D4  003A  1435 0$:      CLRL            R8                                  ; clear device number
                          003C  1436
                          003C  1437          $DS_PAGE
```

```
                                003C            .SBTTL  SUBTEST 8.1:  CSR
                                003C    ;+
                                003C    ; Subtest description:
                                003C    ;
                                003C    ;       This subtest checks that the UBI CSR register is accessible and that
                                003C    ;       writing a one to the status bits results in the bits remaining cleared.
                                003C    ;       In error reporting the UNUSED bits will be masked out since they
                                003C    ;       are unpredictable.  The bits are defined as follows:
                                003C    ;
                                003C    ;       CSR
                                003C    ;            31 30      17    16              15         14 13       0
                                003C    ;       +-----+---------+-----+---------------+----------+---------+
                                003C    ;       | RDS | Unused  | NXM | Map Parity    | Wr Err   | Unused  |
                                003C    ;       +-----+---------+-----+---------------+----------+---------+
                                003C    ;
                                003C    ;
                                003C    ; Subtest steps:
                                003C    ;
                                003C    ;       SUBTEST CSR
                                003C    ;       :  Attempt access to CSR
                                003C    ;       :  IF unsuccessful
                                003C    ;       :  :  THEN REPORT access error
                                003C    ;       :  ENDIF
                                003C    ;       :  CLEAR Status bits (with read)
                                003C    ;       :  IF Status bits not clear
                                003C    ;       :  :  THEN REPORT error
                                003C    ;       :  ENDIF
                                003C    ;       :  WRITE ones to CSR Status Bits
                                003C    ;       :  READ CSR
                                003C    ;       :  IF Status bits not clear
                                003C    ;       :  :  THEN REPORT error
                                003C    ;       :  ENDIF
                                003C    ;       ENDSUBTEST CSR
                                003C    ;
                                003C    ; Errors:
                                003C    ;
                                003C    ;
                                003C    ;-
                                003C
                                003C
                                003C            $DS_BGNSUB
                                003C    T8_S1::
00010030 9F   00000000'EF   FA  003C                    CALLG   $S$, @#DS$BGNSUB
                                0047
              00000000'EF   B4  0047            CLRW    W_FLAGS                         ; clear flags word
                                004D    ;
                                004D    ; Attempt access to UBI CSR, report error if access fails
                                004D    ;
                                004D    1$:     $DS_PROBE_S     UNIT=BEO_UNIT_NO,-
                                004D                            LENGTH=#4,-
                                004D                            ADDRESS=A_UBI_CSR
              00000000'EF   DD  004D                    PUSHL   BEO_UNIT_NO
                       04   DD  0053                    PUSHL   #4
              00F26010'EF   9F  0055                    PUSHAB  A_UBI_CSR
      000101A0 9F      03   FB  005B                    CALLS   #3, @#DS$PROBE
                                0062
                                0062            $DS_BNERROR     3$                      ; br = access successful
```

```
                        50   DD  0062                             PUSHL   R0
                        01   DD  0064                             PUSHL   #$ER
              00000000'8F    DD  0066                             PUSHL   #DS$K_BNERROR
         000100A8 9F    03   FB  006C                             CALLS   #3, @#DS$BRANCH
                     22 50   E8  0073                             BLBS    R0, 3$
                                 0076  1490
         00000000'EF    01   A8  0076  1491          BISW2   #M_NO_CSR,W_FLAGS                ; set no-CSR flag
                                 007D  1492          $DS_ERRHARD_S     UNIT=BE0_UNIT_NO,-     ; report no-access error
                                 007D  1493                            MSGADR=T_CSR_ERR,-
                                 007D  1494                            PRLINK=CSR_ERR
              000015DF'EF    DF  007D                             PUSHAL  CSR_ERR
              00000463'EF    DF  0083                             PUSHAL  T_CSR_ERR
              00000000'EF    DD  0089                             PUSHL   BE0_UNIT_NO
                        01   DD  008F                             PUSHL   #$ER
                                 0091                ;;; TEST 8, SUBTEST 1, ERROR 1
         000100D0 9F    04   FB  0091                             CALLS   #$$M, @#DS$ERRHARD
                                 0098  1495 ;
                                 0098  1496 ; Attempt to clear status bits by reading CSR
                                 0098  1497 ;
              00F26010 9F    D5  0098  1498 3$:      TSTL    @#A_UBI_CSR                      ; read CSR
57   00F26010 9F    7FFE3FFF 8F    CB  009E  1499          BICL3   #M_UBI_NON_STS,@#A_UBI_CSR,R7    ; read again, save status bits
                        57   D5  00AA  1500          TSTL    R7                               ; status bits clear?
                        2B   13  00AC  1501          BEQL    4$                               ; br = status bits clear
                                 00AE  1502
                                 00AE  1503          $DS_ERRHARD_S     UNIT=BE0_UNIT_NO,-     ; report UBI CSR data error
                                 00AE  1504                            MSGADR=T_CSR_ERR,-
                                 00AE  1505                            PRLINK=DATA_ERR,-
                                 00AE  1506                            P1=#A_UBI_CSR,-        ; location
                                 00AE  1507                            P2=#0,-                ; expected value
                                 00AE  1508                            P3=R7,-                ; actual value
                                 00AE  1509                            P4=#T_LONG_ERR         ; data type
              00000DC8'8F    DD  00AE                             PUSHL   #T_LONG_ERR
                        57   DD  00B4                             PUSHL   R7
                        00   DD  00B6                             PUSHL   #0
              00F26010 8F    DD  00B8                             PUSHL   #A_UBI_CSR
              000013C0'EF    DF  00BE                             PUSHAL  DATA_ERR
              00000463'EF    DF  00C4                             PUSHAL  T_CSR_ERR
              00000000'EF    DD  00CA                             PUSHL   BE0_UNIT_NO
                        02   DD  00D0                             PUSHL   #$ER
                                 00D2                ;;; TEST 8, SUBTEST 1, ERROR 2
         000100D0 9F    08   FB  00D2                             CALLS   #$$M, @#DS$ERRHARD
                                 00D9  1510
                                 00D9  1511 4$:      $DS_CKLOOP        3$                     ; scope loop at 3$
       00010040 9F    BC AF   FA  00D9                             CALLG   3$, @#DS$CKLOOP
                                 00E1  1512 ;
                                 00E1  1513 ; Attempt to set Status bits, they should remain clear, report error otherwise
                                 00E1  1514 ;
     00F26010 9F    8001C000 8F    C8  00E1  1515 5$:      BISL2   #M_UBI_STS,@#A_UBI_CSR           ; attempt to set Status bits
57   00F26010 9F    7FFE3FFF 8F    CB  00EC  1516          BICL3   #M_UBI_NON_STS,@#A_UBI_CSR,R7    ; read, save status bits
                        57   D5  00F8  1517          TSTL    R7                               ; status bits clear?
                        2B   13  00FA  1518          BEQL    7$                               ; br = status bits clear
                                 00FC  1519
                                 00FC  1520          $DS_ERRHARD_S     UNIT=BE0_UNIT_NO,-     ; report UBI CSR data error
                                 00FC  1521                            MSGADR=T_CSR_ERR,-
                                 00FC  1522                            PRLINK=DATA_ERR,-
                                 00FC  1523                            P1=#A_UBI_CSR,-        ; location
                                 00FC  1524                            P2=#0,-                ; expected value
```

```
                                    00FC  1525                      P3=R7,-                   ; actual value
                                    00FC  1526                      P4=#T_LONG_ERR            ; data type
                00000DC8'8F    DD   00FC                    PUSHL   #T_LONG_ERR
                         57    DD   0102                    PUSHL   R7
                         00    DD   0104                    PUSHL   #0
                00F26010 8F    DD   0106                    PUSHL   #A_UBI_CSR
                000013C0'EF    DF   010C                    PUSHAL  DATA_ERR
                00000463'EF    DF   0112                    PUSHAL  T_CSR_ERR
                00000000'EF    DD   0118                    PUSHL   BEO_UNIT_NO
                         03    DD   011E                    PUSHL   #$ER
                                    0120        ;;; TEST 8, SUBTEST 1, ERROR 3
         000100D0 9F     08    FB   0120                    CALLS   #$$M, @#DS$ERRHARD
                                    0127  1527
                                    0127  1528 7$:      $DS_CKLOOP      5$                        ; scope loop at 5$
     00010040 9F      B7 AF    FA   0127                    CALLG   5$, @#DS$CKLOOP
                                    012F  1529
                                    012F  1530          $DS_ENDSUB
                                    012F        T8_S1_X:
00010038 9F     00000000'EF    FA   012F                    CALLG   $S$, @#DS$ENDSUB
                                    013A  1531
                                    013A  1532          $DS_PAGE
```

```
                                        013A              .SBTTL  SUBTEST 8.2:  Map Data Bus
                                        013A   1535 ;+
                                        013A   1536 ; Subtest description:
                                        013A   1537 ;
                                        013A   1538 ;           This subtest checks the integrity of the map data bus by floating a one
                                        013A   1539 ;           through a field of zeros and a zero through a field of ones. If all
                                        013A   1540 ;           bits can toggle from a one to a zero then the data bus is considered
                                        013A   1541 ;           to be good.  Only writable bits (31,25,<14:0>) are tested.  The remain-
                                        013A   1542 ;           ing bits are ignored.  In error reporting the unused bits will be
                                        013A   1543 ;           masked out since they are unpredictable.
                                        013A   1544 ;
                                        013A   1545 ; Subtest steps:
                                        013A   1546 ;
                                        013A   1547 ;           SUBTEST Map Data Bus
                                        013A   1548 ;           :  REPEAT
                                        013A   1549 ;           :  :  WRITE data pattern to first Map Entry
                                        013A   1550 ;           :  :  READ pattern back
                                        013A   1551 ;           :  :  IF error
                                        013A   1552 ;           :  :  :  THEN REPORT error
                                        013A   1553 ;           :  :  Update pattern
                                        013A   1554 ;           :  : UNTIL all patterns written
                                        013A   1555 ;           :  ENDREPEAT
                                        013A   1556 ;           ENDSUBTEST Map Data Bus
                                        013A   1557 ;
                                        013A   1558 ; Errors:
                                        013A   1559 ;
                                        013A   1560 ;-
                                        013A   1561           $DS_BGNSUB
                                        013A          T8_S2::
    00010030 9F    0000000C'EF    FA    013A                    CALLG   $S$, @#DS$BGNSUB
                                        0145   1562
                   00000000'EF    B4    0145   1563           CLRW    W_FLAGS                         ; clear flags word
                                        014B   1564 ;
                                        014B   1565 ; Write patterns, read back, report errors if any
                                        014B   1566 ;
              55   000001A7'EF    DE    014B   1567           MOVAL   MAP_ENT_TBL,R5                  ; load address of data table
            00F26800 9F    65     D0    0152   1568 1$:       MOVL    (R5),@#A_MAP_BGN                ; write pattern to map entry
57  00F26800 9F    7DFF8000 8F    CB    0159   1569           BICL3   #M_MAP_NOWRT,@#A_MAP_BGN,R7     ; load actual data into R7
                          65 57   D1    0165   1570           CMPL    R7,(R5)                         ; check data
                          2B      13    0168   1571           BEQL    4$                              ; br = ok
                                        016A   1572
                                        016A   1573           $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-      ; report Map Entry data error
                                        016A   1574                           MSGADR=T_MAP_DBUS_ERR,-
                                        016A   1575                           PRLINK=DATA_ERR,-
                                        016A   1576                           P1=#A_MAP_BGN,-         ; location
                                        016A   1577                           P2=(R5),-               ; expected value
                                        016A   1578                           P3=R7,-                 ; actual value
                                        016A   1579                           P4=#T_LONG_ERR          ; data type
                   00000DC8'8F    DD    016A                      PUSHL   #T_LONG_ERR
                          57      DD    0170                      PUSHL   R7
                          65      DD    0172                      PUSHL   (R5)
                   00F26800 8F    DD    0174                      PUSHL   #A_MAP_BGN
                   000013C0'EF    DF    017A                      PUSHAL  DATA_ERR
                   00000482'EF    DF    0180                      PUSHAL  T_MAP_DBUS_ERR
                   00000000'EF    DD    0186                      PUSHL   BEO_UNIT_NO
                          01      DD    018C                      PUSHL   #$ER
                                        018E          ;;; TEST 8, SUBTEST 2, ERROR 1
```

```
          000100D0 9F    08    FB  018E                   CALLS   #$$M, @#DS$ERRHARD
                                   0195  1580
                                   0195  1581 4$:     $DS_CKLOOP      1$                      ; scope loop at 1$
       00010040 9F    BA AF    FA  0195                   CALLG   1$, @#DS$CKLOOP
                                   019D  1582
          02007FFF 8F    85    D1  019D  1583         CMPL    (R5)+,#^X02007FFF               ; patterns exhausted ?
                         AC    12  01A4  1584         BNEQ    1$                              ; br = patterns not exhausted
                                   01A6  1585
                                   01A6  1586         $DS_ENDSUB
                                   01A6       T8_S2_X:
 00010038 9F    0000000C'EF    FA  01A6                   CALLG   $S$, @#DS$ENDSUB
                                   01B1  1587
                                   01B1  1588         $DS_PAGE
```

```
01B1   1590
01B1                    .SBTTL  SUBTEST 8.3:  Map Address Bus
01B1   1592 ;+
01B1   1593 ; Subtest description:
01B1   1594 ;
01B1   1595 ;        This subtest checks that there are no map address bits stuck or
01B1   1596 ;        shorted. A unique pattern is written into each map entry at maps num-
01B1   1597 ;        bered 0, 1, 2, 4, 8, 16, 32, 64, and 128, (so that each address
01B1   1598 ;        bit assumes both a zero and a one). Reading each of these map
01B1   1599 ;        entries after all patterns are written will reveal any stuck or short-
01B1   1600 ;        ed address bus bits because the last pattern written to a doubly ad-
01B1   1601 ;        dressed map will overwrite the earlier pattern written. Unfortunately
01B1   1602 ;        a data bit fault in one of the RAMs in a particular map entry may point
01B1   1603 ;        erroneously to an address bus bit fault. Therefore, to make this test
01B1   1604 ;        insensitive to a limited number of RAM data bit failures, it is
01B1   1605 ;        necessary to encode each value prior to storing. The Reed-Muller (16,4)
01B1   1606 ;        error-correcting code is used.  In error reporting the unused bits are
01B1   1607 ;        masked out since they are unpredictable.
01B1   1608 ;
01B1   1609 ;        EXPLANATION OF REED-MULLER ERROR-CORRECTING CODE
01B1   1610 ;
01B1   1611 ;        The basis of the Reed-Muller (16,4) coding space comprises the vectors:
01B1   1612 ;
01B1   1613 ;                I          1111111111111111
01B1   1614 ;                V1         0101010101010101
01B1   1615 ;                V2         0011001100110011
01B1   1616 ;                V3         0000111100001111
01B1   1617 ;
01B1   1618 ;        A word is encoded using the following expression:
01B1   1619 ;
01B1   1620 ;                CODEWORD = G0*I XOR G1*V1 XOR G2*V2 XOR G3*V3
01B1   1621 ;
01B1   1622 ;        where G0 is the least significant bit and G3 the most significant bit.
01B1   1623 ;
01B1   1624 ;        Each codeword has 8 disjoint redundant relations due to the nature of
01B1   1625 ;        the encoding vectors.  In V1 the redundant relations are the bit pairs
01B1   1626 ;        (31,30), (29,28), (27,26), etc.  In V2, they are the bit pairs (31,29),
01B1   1627 ;        (30,28), (27,25), etc.  In V3, the relations are (31,27), (30,26),
01B1   1628 ;        (29,25), etc.  Thus, there are three sets of redundant relations in
01B1   1629 ;        each codeword, and therefore, each bit is represented by 8 disjoint
01B1   1630 ;        relations.
01B1   1631 ;
01B1   1632 ;        To decode a particular bit, the value of each of the 8 redundant rela-
01B1   1633 ;        tions is calculated.  The position of the bit in the decoded word de-
01B1   1634 ;        termines which bit pairs will be used.  The original word is represent-
01B1   1635 ;        as:
01B1   1636 ;
01B1   1637 ;                +--+--+--+--+
01B1   1638 ;                |G3|G2|G1|G0|
01B1   1639 ;                +--+--+--+--+
01B1   1640 ;
01B1   1641 ;        The bits G0 - G3 are referred to as information bits.  The LSB has no
01B1   1642 ;        inherent redundant relations, since it is represented by the product
01B1   1643 ;        of itself and the identity vector.  Here it is convenient to introduce
01B1   1644 ;        the notion of pair separation.  The pair separation for the redundant
01B1   1645 ;        relations representing G1 is 1; for G2, 2, and for G3, 4.
01B1   1646 ;
```

```
                                   01B1  1647 ;        After decoding the value of each redundant relation for a particular
                                   01B1  1648 ;        bit, these values are summed.  If there was no corruption of the code-
                                   01B1  1649 ;        word, this sum will be 0 or 8, corresponding to an original value of
                                   01B1  1650 ;        0 or 1.  If there was any corruption, a majority decision must be made,
                                   01B1  1651 ;        i.e., if the sum is 4 or greater, the bit Gn is assumed to have been a
                                   01B1  1652 ;        1, otherwise, it is assumed 0.
                                   01B1  1653 ;
                                   01B1  1654 ;        After decoding the three MSBs, the LSB is decoded by eliminating each
                                   01B1  1655 ;        of the terms G1*V1, G2*V2, and G3*V3, leaving simply G0*I.  If there
                                   01B1  1656 ;        had been no corruption, this term would be 16 0s or 16 1s, representing
                                   01B1  1657 ;        0 or 1 respectively.  Otherwise, another majority decision must be
                                   01B1  1658 ;        made, i.e., if 8 or more bits are set, G0 is a 1, else, it is 0.
                                   01B1  1659 ;
                                   01B1  1660 ;
                                   01B1  1661 ; Subtest steps:
                                   01B1  1662 ;
                                   01B1  1663 ;        SUBTEST Map Address Bus
                                   01B1  1664 ;        :  DO FOR Map Number = {0,1,2,4,8,16,32,64,128,256}
                                   01B1  1665 ;        :  :  WRITE pattern to Map location
                                   01B1  1666 ;        :  ENDDO
                                   01B1  1667 ;        :  DO FOR Map Number = {0,1,2,4,8,16,32,64,128,256}
                                   01B1  1668 ;        :  :  READ pattern from Map location
                                   01B1  1669 ;        :  ENDDO
                                   01B1  1670 ;        :  DECODE Data retrieved
                                   01B1  1671 ;        :  IF error
                                   01B1  1672 ;        :  :  THEN REPORT error
                                   01B1  1673 ;        :  ENDIF
                                   01B1  1674 ;        ENDSUBTEST Map Address Bus
                                   01B1  1675 ;
                                   01B1  1676 ; Errors:
                                   01B1  1677 ;
                                   01B1  1678 ;-
                                   01B1  1679         $DS_BGNSUB
                                   01B1         T8_S3::
  00010030 9F   00000018'EF    FA  01B1                 CALLG   $S$, @#DS$BGNSUB
                                   01BC  1680 ;
                                   01BC  1681 ; Generate Reed-Muller code and load into Map Entry PFN and Byte-offset bits
                                   01BC  1682 ;
                0000172F'EF    16  01BC  1683           JSB     RD_MLLR_ENCODE                        ; encode data
                00000000'EF    B4  01C2  1684           CLRW    W_FLAGS                               ; clear flags word
                         54    7C  01C8  1685           CLRQ    R4                                    ; clear indices
 00F26800 9F44  00000237'EF45  D0  01CA  1686 1$:       MOVL    RD_MLLR_TBL[R5],@#A_MAP_BGN[R4]       ; load pattern into Map Entry
                         55    D6  01D7  1687           INCL    R5                                    ; incr index
            54    54     01    78  01D9  1688           ASHL    #1,R4,R4                              ; float 1 to next Map No bit
                         02    12  01DD  1689           BNEQ    2$                                    ; br = index not 0
                         54    D6  01DF  1690           INCL    R4                                    ; load 1 into index
         00000200 8F     54    D1  01E1  1691 2$:       CMPL    R4,#512                               ; Map Addresses exhausted ?
                         E0    19  01E8  1692           BLSS    1$                                    ; br = Map Nos not exhausted
                                   01EA  1693 ;
                                   01EA  1694 ; Retrieve data from Map Entries, load into table
                                   01EA  1695 ;
                         54    7C  01EA  1696           CLRQ    R4                                    ; clear indices
 00F26800 9F44   7DFF8000 8F   CB  01EC  1697 3$:       BICL3   #M_MAP_NOWRT,@#A_MAP_BGN[R4],RETRIEVE_TBL[R5] ; load act'l data
                00000257'EF45      01F8
                         55    D6  01FE  1698           INCL    R5                                    ; incr Reed-Muller table index
            54    54     01    78  0200  1699           ASHL    #1,R4,R4                              ; float 1 to next Map No bit
                         02    12  0204  1700           BNEQ    4$                                    ; br = index not 0
```

```
                        54  D6  0206  1701          INCL    R4                              ; load 1 into index
          00000200 8F   54  D1  0208  1702 4$:      CMPL    R4,#512                         ; Map Nos exhausted ?
                        DB  19  020F  1703          BLSS    3$                              ; br = Map Nos not exhausted
                                0211  1704 ;
                                0211  1705 ; Decode retrieved data, report errors if any
                                0211  1706 ;
               0000175E'EF  16  0211  1707          JSB     RD_MLLR_DECODE                  ; decode data retrieved
                        54  7C  0217  1708          CLRQ    R4                              ; clear indices
          00000277'EF45 55  D1  0219  1709 5$:      CMPL    R5,DECODE_TBL[R5]               ; check for data error
                        1D  13  0221  1710          BEQL    6$                              ; br = no error
                                0223  1711
                                0223  1712          $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-              ; report Map Address bus err
                                0223  1713                          MSGADR=T_MAP_ABUS_ERR,-
                                0223  1714                          PRLINK=MAP_ADR_ERR,-
                                0223  1715                          P1=R5                   ; bit in error
                        55  DD  0223                    PUSHL   R5
               000013E9'EF  DF  0225                    PUSHAL  MAP_ADR_ERR
               000004AC'EF  DF  022B                    PUSHAL  T_MAP_ABUS_ERR
               00000000'EF  DD  0231                    PUSHL   BEO_UNIT_NO
                        01  DD  0237                    PUSHL   #$ER
                                0239       ;;; TEST 8, SUBTEST 3, ERROR 1
          000100D0 9F   05  FB  0239                    CALLS   #$$M, @#DS$ERRHARD
                                0240  1716
                 D5 55  07  F3  0240  1717 6$:      AOBLEQ  #7,R5,5$                        ; Map Nos exhausted ?
                                0244  1718
                                0244  1719          $DS_ENDSUB
                                0244       T8_S3_X:
     00010038 9F   00000018'EF  FA  0244                    CALLG   $S$, @#DS$ENDSUB
                                024F  1720
                                024F  1721          $DS_PAGE
```

```
                               024F         .SBTTL  SUBTEST 8.4:  Map Entry
                               024F   1724 ;+
                               024F   1725 ; Subtest description:
                               024F   1726 ;
                               024F   1727 ;         This subtest checks that all readable/writeable bits of each map entry
                               024F   1728 ;         are not stuck at zero or one. This is accomplished by writing all zeros
                               024F   1729 ;         to a map entry, then reading it to make certain the bits are not stuck
                               024F   1730 ;         at 1.  Then a pattern of all ones is written to the entry and read
                               024F   1731 ;         again to verify that it contains all ones to check that there are no
                               024F   1732 ;         bits stuck at zero. This is repeated for all map entries.  Again, in
                               024F   1733 ;         error reporting the unused bits will be masked out since they are
                               024F   1734 ;         unpredictable.
                               024F   1735 ;
                               024F   1736 ; Subtest steps:
                               024F   1737 ;
                               024F   1738 ;         SUBTEST Map Entry
                               024F   1739 ;         :  REPEAT
                               024F   1740 ;         :  :  CLEAR Map Entry writable bits
                               024F   1741 ;         :  :  IF Map Entry not clear
                               024F   1742 ;         :  :  :  THEN REPORT error
                               024F   1743 ;         :  :  ENDIF
                               024F   1744 ;         :  :  WRITE Mask to Map Entry
                               024F   1745 ;         :  :  IF Map Entry NEQ Mask
                               024F   1746 ;         :  :  :  THEN REPORT error
                               024F   1747 ;         :  :  ENDIF
                               024F   1748 ;         :  :  CLEAR Map Entry writable bits
                               024F   1749 ;         :  :  IF Map Entry not clear
                               024F   1750 ;         :  :  :  THEN REPORT error
                               024F   1751 ;         :  :  ENDIF
                               024F   1752 ;         :  : UNTIL all Map Entries tested
                               024F   1753 ;         :  ENDREPEAT
                               024F   1754 ;         ENDSUBTEST Map Entry
                               024F   1755 ;
                               024F   1756 ; Errors:
                               024F   1757 ;
                               024F   1758 ;-
                               024F   1759          $DS_BGNSUB
                               024F        T8_S4::
 00010030 9F   00000024'EF  FA 024F                 CALLG   $S$, @#DS$BGNSUB
                               025A   1760
               00000000'EF  B4 025A   1761          CLRW    W_FLAGS                         ; clear flags word
                               0260   1762 ;
                               0260   1763 ; Test the ability to clear map entry, report errors if any
                               0260   1764 ;
          54   00F26800 8F  D0 0260   1765          MOVL    #A_MAP_BGN,R4                   ; load map starting address
                         64 D4 0267   1766 10$:     CLRL    (R4)                            ; clear Map Entry
     57   64   7DFF8000 8F  CB 0269   1767          BICL3   #M_MAP_NOWRT,(R4),R7            ; load actual data into R7
                         27 13 0271   1768          BEQL    30$                             ; br = Map Entry clear
                               0273   1769
                               0273   1770          $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-      ; report Map Entry data error
                               0273   1771                          MSGADR=T_MAP_ENT_ERR,-
                               0273   1772                          PRLINK=DATA_ERR,-
                               0273   1773                          P1=R4,-                 ; location
                               0273   1774                          P2=#0,-                 ; expected value
                               0273   1775                          P3=R7,-                 ; actual value
                               0273   1776                          P4=#T_LONG_ERR          ; data type
               00000DC8'8F  DD 0273                 PUSHL   #T_LONG_ERR
```

```
                    57    DD  0279                        PUSHL   R7
                    00    DD  027B                        PUSHL   #0
                    54    DD  027D                        PUSHL   R4
           000013C0'EF    DF  027F                        PUSHAL  DATA_ERR
           000004D9'EF    DF  0285                        PUSHAL  T_MAP_ENT_ERR
           00000000'EF    DD  028B                        PUSHL   BEO_UNIT_NO
                    01    DD  0291                        PUSHL   #$ER
                              0293          ;;; TEST 8, SUBTEST 4, ERROR 1
      000100D0 9F     08  FB  0293                        CALLS   #$$M, @#DS$ERRHARD
                              029A  1777
                              029A  1778 30$:     $DS_CKLOOP        10$                    ; scope loop at 10$
   00010040 9F     CA AF  FA  029A                        CALLG   10$, @#DS$CKLOOP
                              02A2  1779 ;
                              02A2  1780 ; Test ability to set writable bits, report errors if any
                              02A2  1781 ;
        64    82007FFF 8F  D0  02A2  1782 40$:     MOVL    #M_MAP_WRTBL,(R4)              ; set Map Entry writable bits
   57   64    7DFF8000 8F  CB  02A9  1783          BICL3   #M_MAP_NOWRT,(R4),R7           ; load actual data into R7
        82007FFF 8F   57  D1  02B1  1784          CMPL    R7,#M_MAP_WRTBL                ; Map Entry = mask ?
                    2B    13  02B8  1785          BEQL    45$                            ; br = Map Entry = mask
                              02BA  1786
                              02BA  1787          $DS_ERRHARD_S     UNIT=BEO_UNIT_NO,-     ; report Map Entry data error
                              02BA  1788                            MSGADR=T_MAP_ENT_ERR,-
                              02BA  1789                            PRLINK=DATA_ERR,-
                              02BA  1790                            P1=R4,-                ; location
                              02BA  1791                            P2=#M_MAP_WRTBL,-      ; expected value
                              02BA  1792                            P3=R7,-                ; actual value
                              02BA  1793                            P4=#T_LONG_ERR         ; data type
           00000DC8'8F    DD  02BA                        PUSHL   #T_LONG_ERR
                    57    DD  02C0                        PUSHL   R7
           82007FFF 8F    DD  02C2                        PUSHL   #M_MAP_WRTBL
                    54    DD  02C8                        PUSHL   R4
           000013C0'EF    DF  02CA                        PUSHAL  DATA_ERR
           000004D9'EF    DF  02D0                        PUSHAL  T_MAP_ENT_ERR
           00000000'EF    DD  02D6                        PUSHL   BEO_UNIT_NO
                    02    DD  02DC                        PUSHL   #$ER
                              02DE          ;;; TEST 8, SUBTEST 4, ERROR 2
      000100D0 9F     08  FB  02DE                        CALLS   #$$M, @#DS$ERRHARD
                              02E5  1794
                              02E5  1795 45$:     $DS_CKLOOP        40$                    ; scope loop at 40$
   00010040 9F     BA AF  FA  02E5                        CALLG   40$, @#DS$CKLOOP
                              02ED  1796 ;
                              02ED  1797 ; Test ability to clear writable bits, report errors if any
                              02ED  1798 ;
                    64    D4  02ED  1799 50$:     CLRL    (R4)                           ; clear Map Entry
   57   64    7DFF8000 8F  CB  02EF  1800          BICL3   #M_MAP_NOWRT,(R4),R7           ; load actual data into R7
                    27    13  02F7  1801          BEQL    60$                            ; br = Map Entry clear
                              02F9  1802
                              02F9  1803          $DS_ERRHARD_S     UNIT=BEO_UNIT_NO,-     ; report Map Entry data error
                              02F9  1804                            MSGADR=T_MAP_ENT_ERR,-
                              02F9  1805                            PRLINK=DATA_ERR,-
                              02F9  1806                            P1=R4,-                ; location
                              02F9  1807                            P2=#0,-                ; expected value
                              02F9  1808                            P3=R7,-                ; actual value
                              02F9  1809                            P4=#T_LONG_ERR         ; data type
           00000DC8'8F    DD  02F9                        PUSHL   #T_LONG_ERR
                    57    DD  02FF                        PUSHL   R7
                    00    DD  0301                        PUSHL   #0
```

```
                      54    DD  0303                            PUSHL   R4
             000013C0'EF    DF  0305                            PUSHAL  DATA_ERR
             000004D9'EF    DF  030B                            PUSHAL  T_MAP_ENT_ERR
             00000000'EF    DD  0311                            PUSHL   BEO_UNIT_NO
                      03    DD  0317                            PUSHL   #$ER
                                0319             ;;; TEST 8, SUBTEST 4, ERROR 3
          000100D0 9F   08  FB  0319                            CALLS   #$$M, @#DS$ERRHARD
                                0320   1810
                                0320   1811 60$:     $DS_CKLOOP          50$                        ; scope loop at 50$
     00010040 9F     CA AF  FA  0320                            CALLG   50$, @#DS$CKLOOP
                                0328   1812
 FF35 54    04    00F26FFC 8F  F1  0328   1813      ACBL    #A_MAP_END,#4,R4,10$               ; incr index and br = not done
                                0332   1814
                                0332   1815          $DS_ENDSUB
                                0332            T8_S4_X:
   00010038 9F   00000024'EF  FA  0332                            CALLG   $S$, @#DS$ENDSUB
                                033D   1816
                                033D   1817          $DS_PAGE
```

```
033D               .SBTTL  SUBTEST 8.5:  CPU Read/Write
033D       ;+
033D       ; Subtest description:
033D       ;
033D       ;       This subtest checks the ability of the UBI to handle CPU reads
033D       ;       and writes to the unibus. The UBE data and address registers are writ-
033D       ;       ten and read, checking for stuck at one or zero faults. The following
033D       ;       data patterns are used to perform this test:
033D       ;
033D       ;               0101010101010101
033D       ;               1010101010101010
033D       ;               0011001100110011
033D       ;               0000111100001111
033D       ;               0000000011111111
033D       ;
033D       ;       to check for word writes, and
033D       ;
033D       ;               01010101
033D       ;               10101010
033D       ;               00110011
033D       ;               00001111
033D       ;
033D       ;       to check for byte writes.
033D       ;
033D       ; Subtest steps:
033D       ;
033D       ;       SUBTEST CPU Read/Write
033D       ;       :  PROBE UBE Data Register
033D       ;       :  IF not present
033D       ;       :  :  THEN REPORT error
033D       ;       :  ENDIF
033D       ;       :  REPEAT
033D       ;       :  :  WRITE word pattern to Address register
033D       ;       :  :  READ Address register
033D       ;       :  :  IF error
033D       ;       :  :  :  THEN REPORT error
033D       ;       :  :  ENDIF
033D       ;       :  : UNTIL patterns exhausted
033D       ;       :  ENDREPEAT
033D       ;       :  REPEAT
033D       ;       :  :  WRITE word pattern to Data register
033D       ;       :  :  READ Data register
033D       ;       :  :  IF error
033D       ;       :  :  :  THEN DO
033D       ;       :  :  :  :  REPORT error
033D       ;       :  :  :  :  EXIT Test
033D       ;       :  :  :  ENDDO
033D       ;       :  :  ENDIF
033D       ;       :  : UNTIL patterns exhausted
033D       ;       :  ENDREPEAT
033D       ;       :  REPEAT
033D       ;       :  :  WRITE byte pattern to Data register high byte
033D       ;       :  :  WRITE byte pattern to Data register low byte
033D       ;       :  :  READ Data register high byte
033D       ;       :  :  IF error
033D       ;       :  :  :  THEN REPORT error
033D       ;       :  :  ENDIF
```

```
                                        033D  1876 ;          :  :  READ Data register low byte
                                        033D  1877 ;          :  :  IF error
                                        033D  1878 ;          :  :  :  THEN REPORT error
                                        033D  1879 ;          :  :  ENDIF
                                        033D  1880 ;          :  : UNTIL patterns exhausted
                                        033D  1881 ;          :  ENDREPEAT
                                        033D  1882 ;          ENDSUBTEST CPU Read/Write
                                        033D  1883 ;
                                        033D  1884 ; Errors:
                                        033D  1885 ;
                                        033D  1886 ;-
                                        033D  1887          $DS_BGNSUB
                                        033D       T8_S5::
      00010030 9F     00000030'EF  FA   033D                        CALLG   $S$, @#DS$BGNSUB
                                        0348  1888
                      00000000'EF  B4   0348  1889          CLRW    W_FLAGS                         ; clear flags word
                                        034E  1890 ;
                                        034E  1891 ; Test UBE accessibility.  Report error and exit if not accessible.
                                        034E  1892 ;
                                        034E  1893          $DS_PROBE_S-                            ; probe Data Register
                                        034E  1894                          UNIT=BEO_UNIT_NO,-
                                        034E  1895                          LENGTH=#2,-             ; word access
                                        034E  1896                          ADDRESS=@A_BEO_DB
                      00000000'EF  DD   034E                        PUSHL   BEO_UNIT_NO
                               02  DD   0354                        PUSHL   #2
                      000002AF'FF  9F   0356                        PUSHAB  @A_BEO_DB
             000101A0 9F       03  FB   035C                        CALLS   #3, @#DS$PROBE
                                        0363  1897
                                        0363  1898          $DS_BNERROR     0$                      ; br = no access error
                               50  DD   0363                        PUSHL   R0
                               01  DD   0365                        PUSHL   #$ER
                      00000000'8F  DD   0367                        PUSHL   #DS$K_BNERROR
             000100A8 9F       03  FB   036D                        CALLS   #3, @#DS$BRANCH
                            24 50  E8   0374                        BLBS    R0, 0$
                                        0377  1899
                                        0377  1900          $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-      ; report error
                                        0377  1901                          MSGADR=T_NO_ACCESS,-
                                        0377  1902                          PRLINK=NO_ACCESS,-
                                        0377  1903                          P1=#^XFFF000            ; device address
                      00FFF000 8F  DD   0377                        PUSHL   #^XFFF000
                      0000171B'EF  DF   037D                        PUSHAL  NO_ACCESS
                      000003C3'EF  DF   0383                        PUSHAL  T_NO_ACCESS
                      00000000'EF  DD   0389                        PUSHL   BEO_UNIT_NO
                               01  DD   038F                        PUSHL   #$ER
                                        0391       ;;; TEST 8, SUBTEST 5, ERROR 1
             000100D0 9F       05  FB   0391                        CALLS   #$$M, @#DS$ERRHARD
                                        0398  1904
                                        0398  1905          $DS_EXIT        TEST                    ; exit test
                          15FD     31   0398                        BRW     TEST_008_X      ; EXIT TEST 8
                                        039B  1906 ;
                                        039B  1907 ; Test UBE Address Register with word writes
                                        039B  1908 ;
         55   0000029F'EF     3E        039B  1909 0$:      MOVAW   W_PTRN_TBL,R5                   ; load address of pattern table
         000002B7'FF     65   B0        03A2  1910 1$:      MOVW    (R5),@A_BEO_BA                  ; write pattern to address reg.
         000002B7'FF     65   B1        03A9  1911          CMPW    (R5),@A_BEO_BA                  ; check address register
                         32   13        03B0  1912          BEQL    2$                              ; br = ok
                                        03B2  1913
      57   000002B7'FF   B0  03B2  1914          MOVW     @A_BEO_BA,R7                      ; read data register
                             03B9  1915          $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-        ; report data error
                             03B9  1916                           MSGADR=T_ADR_REG_ERR,-
                             03B9  1917                           PRLINK=DATA_ERR,-
                             03B9  1918                           P1=A_BEO_BA,-             ; location
                             03B9  1919                           P2=(R5),-                 ; expected value
                             03B9  1920                           P3=R7,-                   ; actual error
                             03B9  1921                           P4=#T_WORD_ERR            ; data type
           00000DA0'8F   DD  03B9                         PUSHL    #T_WORD_ERR
                    57   DD  03BF                         PUSHL    R7
                    65   DD  03C1                         PUSHL    (R5)
           000002B7'EF   DD  03C3                         PUSHL    A_BEO_BA
           000013C0'EF   DF  03C9                         PUSHAL   DATA_ERR
           00000511'EF   DF  03CF                         PUSHAL   T_ADR_REG_ERR
           00000000'EF   DD  03D5                         PUSHL    BEO_UNIT_NO
                    02   DD  03DB                         PUSHL    #$ER
                             03DD            ;;; TEST 8, SUBTEST 5, ERROR 2
     000100D0 9F    08   FB  03DD                         CALLS    #$$M, @#DS$ERRHARD
                             03E4  1922
                             03E4  1923 2$:       $DS_CKLOOP          1$                    ; scope loop at 1$
 00010040 9F     BB AF   FA  03E4                         CALLG    1$, @#DS$CKLOOP
                             03EC  1924
        0F0F 8F     85   B1  03EC  1925 3$:       CMPW     (R5)+,#^X0F0F                     ; patterns exhausted ?
                    AF   12  03F1  1926           BNEQ     1$                                ; br = patterns not exhausted
                             03F3  1927
                             03F3  1928 ;
                             03F3  1929 ; Test UBE Data Register with word writes
                             03F3  1930 ;
      55   0000029F'EF   3E  03F3  1931           MOVAW    W_PTRN_TBL,R5                     ; load address of pattern table
 000002AF'FF        65   B0  03FA  1932 4$:       MOVW     (R5),@A_BEO_DB                    ; write pattern to data register
 000002AF'FF        65   B1  0401  1933           CMPW     (R5),@A_BEO_DB                    ; check data register
                    32   13  0408  1934           BEQL     5$                                ; br = ok
                             040A  1935
      57   000002AF'FF   B0  040A  1936           MOVW     @A_BEO_DB,R7                      ; read data register
                             0411  1937           $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-        ; report data error
                             0411  1938                           MSGADR=T_DATA_REG_ERR,-
                             0411  1939                           PRLINK=DATA_ERR,-
                             0411  1940                           P1=A_BEO_DB,-             ; location
                             0411  1941                           P2=(R5),-                 ; expected value
                             0411  1942                           P3=R7,-                   ; actual value
                             0411  1943                           P4=#T_WORD_ERR            ; data type
           00000DA0'8F   DD  0411                         PUSHL    #T_WORD_ERR
                    57   DD  0417                         PUSHL    R7
                    65   DD  0419                         PUSHL    (R5)
           000002AF'EF   DD  041B                         PUSHL    A_BEO_DB
           000013C0'EF   DF  0421                         PUSHAL   DATA_ERR
           00000540'EF   DF  0427                         PUSHAL   T_DATA_REG_ERR
           00000000'EF   DD  042D                         PUSHL    BEO_UNIT_NO
                    03   DD  0433                         PUSHL    #$ER
                             0435            ;;; TEST 8, SUBTEST 5, ERROR 3
     000100D0 9F    08   FB  0435                         CALLS    #$$M, @#DS$ERRHARD
                             043C  1944
                             043C  1945 5$:       $DS_CKLOOP          4$                    ; scope loop at 4$
 00010040 9F     BB AF   FA  043C                         CALLG    4$, @#DS$CKLOOP
                             0444  1946
        00FF 8F     85   B1  0444  1947           CMPW     (R5)+,#^X00FF                     ; patterns exhausted ?
                    AF   12  0449  1948           BNEQ     4$                                ; br = patterns not exhausted
```

```
                               044B  1949
                               044B  1950 ;
                               044B  1951 ; Test UBE Data Register high and low bytes with byte writes
                               044B  1952 ;
        54   000002AF'EF   D0  044B  1953          MOVL    A_BEO_DB,R4                ; load adr of UBE data reg
        55   0000029F'EF   3E  0452  1954 6$:      MOVAW   W_PTRN_TBL,R5              ; load adr of pattern table
                64    65   90  0459  1955 7$:      MOVB    (R5),(R4)                  ; write pattern to data byte
                64    65   91  045C  1956          CMPB    (R5),(R4)                  ; check data byte
                      2A   13  045F  1957          BEQL    8$                         ; br = ok
                               0461  1958
                57    64   90  0461  1959          MOVB    (R4),R7                    ; read data register
                               0464  1960          $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,- ; report data error
                               0464  1961                          MSGADR=T_DATA_REG_ERR,-
                               0464  1962                          PRLINK=DATA_ERR,-
                               0464  1963                          P1=R4,-            ; location
                               0464  1964                          P2=(R5),-          ; expected value
                               0464  1965                          P3=R7,-            ; actual value
                               0464  1966                          P4=#T_BYTE_ERR     ; data type
           00000D72'8F   DD  0464                          PUSHL   #T_BYTE_ERR
                    57   DD  046A                          PUSHL   R7
                    65   DD  046C                          PUSHL   (R5)
                    54   DD  046E                          PUSHL   R4
           000013C0'EF   DF  0470                          PUSHAL  DATA_ERR
           00000540'EF   DF  0476                          PUSHAL  T_DATA_REG_ERR
           00000000'EF   DD  047C                          PUSHL   BEO_UNIT_NO
                    04   DD  0482                          PUSHL   #$ER
                             0484         ;;; TEST 8, SUBTEST 5, ERROR 4
     000100D0 9F    08   FB  0484                          CALLS   #$$M, @#DS$ERRHARD
                             048B  1967
                             048B  1968 8$:     $DS_CKLOOP      7$                 ; scope loop at 7$
  00010040 9F    CB AF   FA  048B                          CALLG   7$, @#DS$CKLOOP
                             0493  1969
        0F0F 8F    85    B1  0493  1970         CMPW    (R5)+,#^X0F0F              ; patterns exhausted ?
                   BF    12  0498  1971         BNEQ    7$                         ; br = patterns not exhausted
           B4 54   00    E3  049A  1972         BBCS    #0,R4,6$                   ; br = low & high bytes tested
                             049E  1973 9$:
                             049E  1974         $DS_ENDSUB
                             049E         T8_S5_X:
00010038 9F   00000030'EF  FA  049E                        CALLG   $S$, @#DS$ENDSUB
                             04A9  1975
                             04A9  1976         $DS_PAGE
```

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                                  04A9              .SBTTL  SUBTEST 8.6:  Interrupts
                                  04A9  1979 ;+
                                  04A9  1980 ; Subtest description:
                                  04A9  1981 ;
                                  04A9  1982 ;          This subtest checks the ability of the UBI to handle interrupts at BR4-
                                  04A9  1983 ;          BR7, using the UBE to initiate interrupts at each BR level.  The
                                  04A9  1984 ;          service routine is set up to set flags if the interrupt occurs or if
                                  04A9  1985 ;          error conditions (at wrong IPL, wrong vector) exist.  Any errors are
                                  04A9  1986 ;          reported.
                                  04A9  1987 ;
                                  04A9  1988 ; Subtest steps:
                                  04A9  1989 ;
                                  04A9  1990 ;          SUBTEST INTERRUPTS
                                  04A9  1991 ;          :  Set IPL at BR7 (17(X))
                                  04A9  1992 ;          :  Set up UBE to interrupt upon becoming bus master at all 4 levels
                                  04A9  1993 ;          :  DO FOR BR level = {4,5,6,7}
                                  04A9  1994 ;          :  :  Set IPL to prohibit BR interrupt
                                  04A9  1995 ;          :  :  If interrupt occurs
                                  04A9  1996 ;          :  :  :  THEN REPORT error
                                  04A9  1997 ;          :  :  ENDIF
                                  04A9  1998 ;          :  :  Decrement IPL
                                  04A9  1999 ;          :  :  If interrupt does not occur OR at wrong IPL OR wrong vector
                                  04A9  2000 ;          :  :  :  THEN REPORT error
                                  04A9  2001 ;          :  :  ENDIF
                                  04A9  2002 ;          :  ENDDO
                                  04A9  2003 ;          ENDSUBTEST INTERRUPTS
                                  04A9  2004 ;
                                  04A9  2005 ; Errors:
                                  04A9  2006 ;
                                  04A9  2007 ;-
                                  04A9  2008          $DS_BGNSUB
                                  04A9          T8_S6::
   00010030 9F    0000003C'EF   FA  04A9                    CALLG   $S$, @#DS$BGNSUB
                                  04B4  2009
                                  04B4  2010          $DS_CHANNEL_S   UNIT=BEO_UNIT_NO,-        ; clear channel status
                                  04B4  2011                          FUNC=#CHC$_CLEAR,-
                                  04B4  2012                          VECADR=BR_SERVICE,-
                                  04B4  2013                          STSADR=L_UBI_STATUS
                  000000AF'EF   7F  04B4                    PUSHAQ  L_UBI_STATUS
                  00001A3C'EF   DF  04BA                    PUSHAL  BR_SERVICE
                  00000000'8F   DD  04C0                    PUSHL   #CHC$_CLEAR
                  00000000'EF   DD  04C6                    PUSHL   BEO_UNIT_NO
         00010180 9F       04   FB  04CC                    CALLS   #4, @#DS$CHANNEL
                                  04D3  2014          $DS_BNERROR     0$                        ; br = no error
                           50   DD  04D3                    PUSHL   R0
                           01   DD  04D5                    PUSHL   #$ER
                  00000000'8F   DD  04D7                    PUSHL   #DS$K_BNERROR
         000100A8 9F       03   FB  04DD                    CALLS   #3, @#DS$BRANCH
                        1E 50   E8  04E4                    BLBS    R0, 0$
                                  04E7  2015          $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-        ; report channel error
                                  04E7  2016                          MSGADR=T_CHANNEL_ERR,-
                                  04E7  2017                          PRLINK=CHANNEL_ERR
                  000016CC'EF   DF  04E7                    PUSHAL  CHANNEL_ERR
                  000012FF'EF   DF  04ED                    PUSHAL  T_CHANNEL_ERR
                  00000000'EF   DD  04F3                    PUSHL   BEO_UNIT_NO
                           01   DD  04F9                    PUSHL   #$ER
                                  04FB          ;;; TEST 8, SUBTEST 6, ERROR 1
```

```
        000100D0 9F     04   FB  04FB                          CALLS    #$$M, @#DS$ERRHARD
                                 0502  2018         $DS_ABORT         TEST                          ; abort test
                        50   D4  0502                          CLRL     R0                    ; SEND A WARNING TO THE SUPERVISOR
                             04  0504                          RET                            ; TERMINATE TEST
                                 0505  2019
                                 0505  2020 0$:     $DS_CHANNEL_S     UNIT=BEO_UNIT_NO,-        ; enable interrupts
                                 0505  2021                           FUNC=#CHC$_ENINT,-
                                 0505  2022                           VECADR=BR_SERVICE,-
                                 0505  2023                           STSADR=L_UBI_STATUS
             000000AF'EF    7F   0505                          PUSHAQ   L_UBI_STATUS
             00001A3C'EF    DF   050B                          PUSHAL   BR_SERVICE
             00000000'8F    DD   0511                          PUSHL    #CHC$_ENINT
             00000000'EF    DD   0517                          PUSHL    BEO_UNIT_NO
        00010180 9F     04   FB  051D                          CALLS    #4, @#DS$CHANNEL
                                 0524  2024         $DS_BNERROR       5$                            ; br = no error
                        50   DD  0524                          PUSHL    R0
                        02   DD  0526                          PUSHL    #$ER
             00000000'8F    DD   0528                          PUSHL    #DS$K_BNERROR
        000100A8 9F     03   FB  052E                          CALLS    #3, @#DS$BRANCH
                     1E 50   E8  0535                          BLBS     R0, 5$
                                 0538  2025         $DS_ERRHARD_S     UNIT=BEO_UNIT_NO,-        ; report channel error
                                 0538  2026                           MSGADR=T_CHANNEL_ERR,-
                                 0538  2027                           PRLINK=CHANNEL_ERR
             000016CC'EF    DF   0538                          PUSHAL   CHANNEL_ERR
             000012FF'EF    DF   053E                          PUSHAL   T_CHANNEL_ERR
             00000000'EF    DD   0544                          PUSHL    BEO_UNIT_NO
                        02   DD  054A                          PUSHL    #$ER
                                 054C              ;;; TEST 8, SUBTEST 6, ERROR 2
        000100D0 9F     04   FB  054C                          CALLS    #$$M, @#DS$ERRHARD
                                 0553  2028         $DS_ABORT         TEST                          ; abort test
                        50   D4  0553                          CLRL     R0                    ; SEND A WARNING TO THE SUPERVISOR
                             04  0555                          RET                            ; TERMINATE TEST
                                 0556  2029
                   37   00   DA  0556  2030 5$:     MTPR     #0,#PR$L_UB_INIT                       ; initialize Unibus devices
        59   00000307'EF    3E   0559  2031         MOVAW    UBE_BR7_INTR,R9                        ; load command table address
        000000AB'EF     07   D0  0560  2032         MOVL     #7,L_BR_LVL                            ; load initial BR intr level
        000000A7'EF     17   D0  0567  2033         MOVL     #^X17,L_IPL                            ; load initial prio level
                                 056E  2034         $DS_SETIPL_S      LEVEL=L_IPL                   ; set IPL at 17
             000000A7'EF    DD   056E                          PUSHL    L_IPL
        00010178 9F     01   FB  0574                          CALLS    #1, @#DS$SETIPL
                                 057B  2035 ;
                                 057B  2036 ; If Ready bit not set then report error and abort test
                                 057B  2037 ;
             00000000'EF    B4   057B  2038 10$:    CLRW     W_FLAGS                                ; clear flags word
     1E 000002BF'FF     07   E0  0581  2039         BBS      #V_RDY,@A_BEO_CR1,20$                  ; br = ready bit set
                                 0589  2040         $DS_ERRHARD_S     UNIT=BEO_UNIT_NO,-
                                 0589  2041                           MSGADR=T_INTR_ERR,-
                                 0589  2042                           PRLINK=XFER_ERR
             00001420'EF    DF   0589                          PUSHAL   XFER_ERR
             000007DF'EF    DF   058F                          PUSHAL   T_INTR_ERR
             00000000'EF    DD   0595                          PUSHL    BEO_UNIT_NO
                        03   DD  059B                          PUSHL    #$ER
                                 059D              ;;; TEST 8, SUBTEST 6, ERROR 3
        000100D0 9F     04   FB  059D                          CALLS    #$$M, @#DS$ERRHARD
                                 05A4  2043
                                 05A4  2044         $DS_ABORT         TEST                          ; abort test
                        50   D4  05A4                          CLRL     R0                    ; SEND A WARNING TO THE SUPERVISOR
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                       04  05A6                    RET                                   ; TERMINATE TEST
                           05A7   2045 ;
                           05A7   2046 ; Check that interrupt does not occur when IPL should prohibit
                           05A7   2047 ;
        00001850'EF    16  05A7   2048 20$:    JSB      UBE_SET_UP                   ; load up UBE registers
                           05AD   2049         $DS_WAITMS_S    TIME=#1               ; wait 1 msec
                 00    DD  05AD                         PUSHL   #0
                 01    DD  05AF                         PUSHL   #1
        00010060 9F    02  FB  05B1                     CALLS   #2, @#DS$WAITMS
     21 00000000'EF    03  E1  05B8   2050     BBC      #V_BR_INTR,W_FLAGS,40$      ; br = no unexpected interrupt
                           05C0   2051
                           05C0   2052         $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-   ; report unexpected interrupt
                           05C0   2053                          MSGADR=T_INTR_ERR,-
                           05C0   2054                          PRLINK=INTR_ERR
        0000166E'EF    DF  05C0                         PUSHAL  INTR_ERR
        000007DF'EF    DF  05C6                         PUSHAL  T_INTR_ERR
        00000000'EF    DD  05CC                         PUSHL   BEO_UNIT_NO
                 04    DD  05D2                         PUSHL   #$ER
                           05D4        ;;; TEST 8, SUBTEST 6, ERROR 4
        000100D0 9F    04  FB  05D4                     CALLS   #$$M, @#DS$ERRHARD
                           05DB   2055
        00000000'EF    B4  05DB   2056         CLRW             W_FLAGS              ; clear flags word
                           05E1   2057 ;
                           05E1   2058 ; Decrement IPL to allow the interrupt and check that it occurs with the correct
                           05E1   2059 ; vector and at the correct IPL
                           05E1   2060 ;
        000000A7'EF    D7  05E1   2061 40$:    DECL     L_IPL                        ; decrement IPL
                           05E7   2062         $DS_SETIPL_S     LEVEL=L_IPL          ; set IPL to allow interrupt
        000000A7'EF    DD  05E7                         PUSHL   L_IPL
        00010178 9F    01  FB  05ED                     CALLS   #1, @#DS$SETIPL
                           05F4   2063
        00000000'EF    02  C8  05F4   2064 50$:    BISL2    #M_EXP_BR_INTR,W_FLAGS      ; set expect interrupt flag
                           05FB   2065         $DS_WAITMS_S    TIME=#1               ; wait 1 msec
                 00    DD  05FB                         PUSHL   #0
                 01    DD  05FD                         PUSHL   #1
        00010060 9F    02  FB  05FF                     CALLS   #2, @#DS$WAITMS
     08 00000000'EF    03  E1  0606   2066     BBC      #V_BR_INTR,W_FLAGS,60$      ; br = no interrupt occurred
     21 00000000'EF    04  E1  060E   2067     BBC      #V_INTR_ERR,W_FLAGS,70$     ; br = vector & BR level okay
                           0616   2068
                           0616   2069 60$:    $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-
                           0616   2070                          MSGADR=T_INTR_ERR,-
                           0616   2071                          PRLINK=INTR_ERR
        0000166E'EF    DF  0616                         PUSHAL  INTR_ERR
        000007DF'EF    DF  061C                         PUSHAL  T_INTR_ERR
        00000000'EF    DD  0622                         PUSHL   BEO_UNIT_NO
                 05    DD  0628                         PUSHL   #$ER
                           062A        ;;; TEST 8, SUBTEST 6, ERROR 5
        000100D0 9F    04  FB  062A                     CALLS   #$$M, @#DS$ERRHARD
                           0631   2072
        00000000'EF    B4  0631   2073         CLRW             W_FLAGS              ; clear flags word
                           0637   2074 ;
                           0637   2075 ; If all levels tested then branch out of loop
                           0637   2076 ;
        000000AB'EF    D7  0637   2077 70$:    DECL     L_BR_LVL                     ; decr BR level
     03 000000AB'EF    D1  063D   2078         CMPL     L_BR_LVL,#3                  ; all 4 intr levels tested?
                 03    13  0644   2079         BEQL     90$                          ; br = all 4 levels tested
               FF32    31  0646   2080         BRW      10$                          ; go to beginning of loop
```

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                               0649  2081 90$:      $DS_SETIPL_S    LEVEL=#0                ; restore IPL to 0
                      00   DD  0649                             PUSHL   #0
       00010178 9F    01   FB  064B                             CALLS   #1, @#DS$SETIPL
                               0652  2082
                               0652  2083           $DS_ENDSUB
                               0652        T8_S6_X:
  00010038 9F    0000003C'EF   FA  0652                         CALLG   $S$, @#DS$ENDSUB
                               065D  2084
                               065D  2085           $DS_PAGE
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                                   065D           .SBTTL  SUBTEST 8.7:  DATI 1
                                   065D  2088 ;+
                                   065D  2089 ; Subtest description:
                                   065D  2090 ;
                                   065D  2091 ;        This subtest checks the ability to execute a Unibus read (DATI)
                                   065D  2092 ;        transaction.  The UBE Data register is cleared with a CPU write
                                   065D  2093 ;        and a unique data pattern is written to a main memory location.
                                   065D  2094 ;        All usable Map Registers are validated and set up to access the main
                                   065D  2095 ;        memory location.  A DATI is executed and after a nominal wait, the
                                   065D  2096 ;        UBE Data register is read.  Transfers are made from longword- and
                                   065D  2097 ;        word-aligned locations.
                                   065D  2098 ;
                                   065D  2099 ;
                                   065D  2100 ; Subtest steps:
                                   065D  2101 ;
                                   065D  2102 ;        SUBTEST DATI 1
                                   065D  2103 ;        :  Size UNIBUS
                                   065D  2104 ;        :  IF no usable map entries
                                   065D  2105 ;        :  :  THEN DO
                                   065D  2106 ;        :  :  :  PRINT exit warning
                                   065D  2107 ;        :  :  :  EXIT test
                                   065D  2108 ;        :  :  ENDDO
                                   065D  2109 ;        :  ENDIF
                                   065D  2110 ;        :  Validate and point all usable Map Entries to main memory address
                                   065D  2111 ;        :  DO FOR Alignment = {word, longword}
                                   065D  2112 ;        :  :  Load UBE address registers
                                   065D  2113 ;        :  :  Execute DATI
                                   065D  2114 ;        :  :  Wait
                                   065D  2115 ;        :  :  IF Error
                                   065D  2116 ;        :  :  :  THEN REPORT Error
                                   065D  2117 ;        :  :  ENDIF
                                   065D  2118 ;        :  ENDDO
                                   065D  2119 ;        ENDSUBTEST DATI 1
                                   065D  2120 ;
                                   065D  2121 ; Errors:
                                   065D  2122 ;
                                   065D  2123 ;-
                                   065D  2124         $DS_BGNSUB
                                   065D        T8_S7::
 00010030 9F    00000048'EF    FA  065D                         CALLG   $S$, @#DS$BGNSUB
                                   0668  2125
                                   0668  2126         $DS_CHANNEL_S   UNIT=BEO_UNIT_NO,-        ; enable interrupts
                                   0668  2127                         FUNC=#CHC$_ENINT,-
                                   0668  2128                         VECADR=INTR_SERVICE,-
                                   0668  2129                         STSADR=L_UBI_STATUS
               000000AF'EF    7F  0668                         PUSHAQ  L_UBI_STATUS
               00001A6C'EF    DF  066E                         PUSHAL  INTR_SERVICE
               00000000'8F    DD  0674                         PUSHL   #CHC$_ENINT
               00000000'EF    DD  067A                         PUSHL   BEO_UNIT_NO
        00010180 9F    04     FB  0680                         CALLS   #4, @#DS$CHANNEL
                                   0687  2130         $DS_BNERROR     0$                        ; br = no error
                       50     DD  0687                         PUSHL   R0
                       01     DD  0689                         PUSHL   #$ER
               00000000'8F    DD  068B                         PUSHL   #DS$K_BNERROR
        000100A8 9F    03     FB  0691                         CALLS   #3, @#DS$BRANCH
                    1E 50     E8  0698                         BLBS    R0, 0$
                                   069B  2131         $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-        ; report channel error
                                   069B  2132                      MSGADR=T_CHANNEL_ERR,-
                                   069B  2133                      PRLINK=CHANNEL_ERR
            000016CC'EF       DF   069B                   PUSHAL   CHANNEL_ERR
            000012FF'EF       DF   06A1                   PUSHAL   T_CHANNEL_ERR
            00000000'EF       DD   06A7                   PUSHL    BEO_UNIT_NO
                     01       DD   06AD                   PUSHL    #$ER
                                   06AF        ;;; TEST 8, SUBTEST 7, ERROR 1
       000100D0 9F   04       FB   06AF                   CALLS    #$$M, @#DS$ERRHARD
                                   06B6  2134         $DS_ABORT    TEST                     ; abort test
                     50       D4   06B6                   CLRL     R0               ; SEND A WARNING TO THE SUPERVISOR
                              04   06B8                   RET                       ; TERMINATE TEST
                                   06B9  2135
            00000000'EF       B4   06B9  2136 0$:     CLRW     W_FLAGS                       ; clear flags word
                  37   00     DA   06BF  2137         MTPR     #0,#PR$L_UB_INIT              ; initialize Unibus devices
            00001867'EF       16   06C2  2138         JSB      UNIBUS_SIZER                  ; size Unibus address space
            00000000'FF       D4   06C8  2139         CLRL     @A_UBE_BUFFER_0               ; clear buffer longword
       56   00000000'EF       D0   06CE  2140         MOVL     A_UBE_BUFFER_0,R6             ; load adr of buffer
                  66   01     D0   06D5  2141         MOVL     #1,(R6)                       ; load data pattern
  0000004A'EF   56   0F   09  EF   06D8  2142         EXTZV    #9,#15,R6,L_PAGE_NO           ; extract Page Frame Number
            0000192A'EF       16   06E1  2143         JSB      ALL_MAPS
                                   06E7  2144 ;
                                   06E7  2145 ; Exit test if no Map Entries are usable since all the remaining subtests
                                   06E7  2146 ; depend upon the availability of usable map registers.
                                   06E7  2147 ;
            00000002'EF       D5   06E7  2148         TSTL     FRST_VAL_MAP                  ; was valid map found ?
                     10       18   06ED  2149         BGEQ     1$                            ; br = valid map found
                                   06EF  2150         $DS_PRINTB_S   FORMAT=T_NO_MAPS        ; print exit warning
            00000437'EF       9F   06EF                   PUSHAB   T_NO_MAPS
       000100E0 9F   01       FB   06F5                   CALLS    #$$N, @#DS$PRINTB
                                   06FC  2151         $DS_EXIT     TEST                     ; exit test
                   1299       31   06FC                   BRW      TEST_008_X       ; EXIT TEST 8
                                   06FF  2152 ;
                                   06FF  2153 ; Load address into DATI command table.
                                   06FF  2154 ;
                     58       D4   06FF  2155 1$:     CLRL     R8                            ; clear device number
       59   000002CB'EF       DE   0701  2156         MOVAL    UBE_DATI_1,R9                 ; load command table address
               06 A9   56     B0   0708  2157         MOVW     R6,6(R9)                      ; load offset within page
 06 A9   09   09   00000002'EF F0  070C  2158         INSV     FRST_VAL_MAP,#9,#9,6(R9)      ; load Map Number
                                   0716  2159 ;
                                   0716  2160 ; If ready bit not set then report error and abort test
                                   0716  2161 ;
       25 000002BF'FF   07    E0   0716  2162 3$:     BBS      #V_RDY,@A_BEO_CR1,5$          ; br = ready bit set
                                   071E  2163
   0000004E'EF   00F26010 9F  D0   071E  2164         MOVL     @#A_UBI_CSR,L_SAVE_CSR        ; save UBI CSR
                                   0729  2165         $DS_ERRHARD_S   MSGADR=T_DATI_ERR,-    ; report no-RDY error
                                   0729  2166                         PRLINK=XFER_ERR
            00001420'EF       DF   0729                   PUSHAL   XFER_ERR
            0000056C'EF       DF   072F                   PUSHAL   T_DATI_ERR
                     00       DD   0735                   PUSHL    #0
                     02       DD   0737                   PUSHL    #$ER
                                   0739        ;;; TEST 8, SUBTEST 7, ERROR 2
       000100D0 9F   04       FB   0739                   CALLS    #$$M, @#DS$ERRHARD
                                   0740  2167
                                   0740  2168         $DS_ABORT    TEST                     ; abort test
                     50       D4   0740                   CLRL     R0               ; SEND A WARNING TO THE SUPERVISOR
                              04   0742                   RET                       ; TERMINATE TEST
                                   0743  2169 ;
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                                         0743  2170 ; Execute DATI
                                         0743  2171 ;
              00001850'EF        16      0743  2172 5$:     JSB     UBE_SET_UP
                                         0749  2173         $DS_WAITMS_S    TIME=#1                ; wait 1 msec
                       00        DD      0749                       PUSHL   #0
                       01        DD      074B                       PUSHL   #1
         00010060 9F   02        FB      074D                       CALLS   #2, @#DS$WAITMS
                                         0754  2174 ;
                                         0754  2175 ; Check for data or execution errors and report if any
                                         0754  2176 ;
   0000004E'EF    00F26010 9F    D0      0754  2177         MOVL    @#A_UBI_CSR,L_SAVE_CSR         ; save UBI CSR
           01     000002AF'FF    B1      075F  2178         CMPW    @A_BEO_DB,#1                   ; check UBE data register
                           12    13      0766  2179         BEQL    6$                             ; br = no data error
           52     000002AF'FF    3C      0768  2180         MOVZWL  @A_BEO_DB,R2                   ; extend actual data
      00000000'EF       1000 8F  A8      076F  2181         BISW2   #M_DATA_ERR,W_FLAGS            ; set data error flag
                           15    11      0778  2182         BRB     7$                             ; br to error report
        0D 000002BF'FF     0F    E0      077A  2183 6$:     BBS     #V_ERR,@A_BEO_CR1,7$           ; br = UBE shows error
   0000004E'EF    8001C000 8F    D3      0782  2184         BITL    #M_UBI_STS,L_SAVE_CSR          ; check UBI CSR status bits
                           37    13      078D  2185         BEQL    9$                             ; br = no UBI error
                                         078F  2186
                                         078F  2187 7$:     $DS_ERRHARD_S       UNIT=BEO_UNIT_NO,- ; report data error
                                         078F  2188                             MSGADR=T_DATI_ERR,-
                                         078F  2189                             PRLINK=XFER_ERR,-
                                         078F  2190                             P1=A_BEO_DB,-      ; location
                                         078F  2191                             P2=#1,-            ; expected value
                                         078F  2192                             P3=R2,-            ; actual value
                                         078F  2193                             P4=#T_WORD_ERR,-   ; data type
                                         078F  2194                             P5=FRST_VAL_MAP    ; map number used
              00000002'EF        DD      078F                       PUSHL   FRST_VAL_MAP
              00000DA0'8F        DD      0795                       PUSHL   #T_WORD_ERR
                       52        DD      079B                       PUSHL   R2
                       01        DD      079D                       PUSHL   #1
              000002AF'EF        DD      079F                       PUSHL   A_BEO_DB
              00001420'EF        DF      07A5                       PUSHAL  XFER_ERR
              0000056C'EF        DF      07AB                       PUSHAL  T_DATI_ERR
              00000000'EF        DD      07B1                       PUSHL   BEO_UNIT_NO
                       03        DD      07B7                       PUSHL   #SER
                                         07B9       ;;; TEST 8, SUBTEST 7, ERROR 3
         000100D0 9F   09        FB      07B9                       CALLS   #$$M, @#DS$ERRHARD
                                         07C0  2195
              00000000'EF        B4      07C0  2196         CLRW    W_FLAGS                        ; clear flags word
                                         07C6  2197 9$:     $DS_CKLOOP      1$                     ; scope loop at 1$
     00010040 9F      FF35 CF    FA      07C6                       CALLG   1$, @#DS$CKLOOP
                                         07CF  2198
             06 56     01        E2      07CF  2199         BBSS    #1,R6,10$                      ; br = done for longword & word
                66     01        D0      07D3  2200         MOVL    #1,(R6)                        ; load data in buffer (wd-algnd)
                     FF26        31      07D6  2201         BRW     1$                             ; br, do for word alignment
                                         07D9  2202 10$:
                                         07D9  2203         $DS_ENDSUB
                                         07D9       T8_S7_X:
   00010038 9F    00000048'EF    FA      07D9                       CALLG   $S$, @#DS$ENDSUB
                                         07E4  2204
                                         07E4  2205         $DS_PAGE
```

```
                                  07E4              .SBTTL  SUBTEST 8.8:  Map Select
                                  07E4  2208 ;+
                                  07E4  2209 ; Subtest description:
                                  07E4  2210 ;
                                  07E4  2211 ;       This subtest checks the ability of the UBI to correctly select
                                  07E4  2212 ;       a map from the page frame of the unibus address. The type of fault that
                                  07E4  2213 ;       could occur here is a stuck or shorted Unibus address bit, which would
                                  07E4  2214 ;       cause the wrong map entry to be selected. In order to detect this type
                                  07E4  2215 ;       of fault, the following steps are executed:
                                  07E4  2216 ;
                                  07E4  2217 ; Subtest steps:
                                  07E4  2218 ;
                                  07E4  2219 ;       SUBTEST MAP SELECT
                                  07E4  2220 ;       :  Invalidate all Maps
                                  07E4  2221 ;       :  DO FOR Map Number = {0,1,2,4,8,16,32,64,128,256}
                                  07E4  2222 ;       :  :  IF Map Entry usable
                                  07E4  2223 ;       :  :  :  THEN DO
                                  07E4  2224 ;       :  :  :  :  VALIDATE Map Entry
                                  07E4  2225 ;       :  :  :  :  CLEAR UBE Data register
                                  07E4  2226 ;       :  :  :  :  EXECUTE DATI
                                  07E4  2227 ;       :  :  :  :  WAIT
                                  07E4  2228 ;       :  :  :  :  IF error
                                  07E4  2229 ;       :  :  :  :  :  THEN REPORT error
                                  07E4  2230 ;       :  :  :  :  ENDIF
                                  07E4  2231 ;       :  :  :  :  INVALIDATE Map Entry
                                  07E4  2232 ;       :  :  :  ENDDO
                                  07E4  2233 ;       :  :  ENDIF
                                  07E4  2234 ;       :  ENDDO
                                  07E4  2235 ;       ENDSUBTEST MAP SELECT
                                  07E4  2236 ;
                                  07E4  2237 ; Errors:
                                  07E4  2238 ;
                                  07E4  2239 ;-
                                  07E4  2240         $DS_BGNSUB
                                  07E4       T8_S8::
  00010030 9F   00000054'EF   FA  07E4                       CALLG   $S$, @#DS$BGNSUB
                                  07EF  2241
                00000000'EF   B4  07EF  2242         CLRW    W_FLAGS                         ; clear flags word
                    37   00   DA  07F5  2243         MTPR    #0,#PR$L_UB_INIT                ; initialize Unibus devices
                000018FB'EF   16  07F8  2244         JSB     INVAL_MAPS                      ; invalidate all Map Entries
           00000000'FF   01   D0  07FE  2245         MOVL    #1,@A_UBE_BUFFER_0              ; load data into buffer
           56   00000000'EF   D0  0805  2246         MOVL    A_UBE_BUFFER_0,R6               ; load memory loc address
 0000004A'EF   56   0F   09   EF  080C  2247         EXTZV   #9,#15,R6,L_PAGE_NO             ; extract page frame number
                                  0815  2248 ;
                                  0815  2249 ; If map is usable then: load address into DATI command table, load Map Entry
                                  0815  2250 ; PFN, validate Map Entry
                                  0815  2251 ;
                         54   D4  0815  2252         CLRL    R4                              ; clear index
        03 00000006'EF   54   E0  0817  2253 1$:     BBS     R4,V_VALID_MAPS,2$              ; br = usable Map Entry
                       00D9   31  081F  2254         BRW     7$                              ; br = not usable Map Entry
           59   000002CB'EF   DE  0822  2255 2$:     MOVAL   UBE_DATI_1,R9                   ; load command table address
                 06 A9   56   B0  0829  2256         MOVW    R6,6(R9)                        ; load offset within page
       06 A9   09   09   54   F0  082D  2257         INSV    R4,#9,#9,6(R9)                  ; load Map Number
00F26800 9F44   0000004A'EF   D0  0833  2258         MOVL    L_PAGE_NO,@#A_MAP_BGN[R4]       ; load Map Entry PFN
00F26800 9F44   80000000 8F   C8  083F  2259         BISL2   #M_MAP_VAL,@#A_MAP_BGN[R4]      ; set Map Entry Valid bit
                                  084B  2260 ;
                                  084B  2261 ; If ready bit not set then report error and abort test
```

```
                                     084B  2262 ;
        29 000002BF'FF     07    E0  084B  2263 3$:      BBS      #V_RDY,@A_BEO_CR1,4$              ; br = ready bit set
                                     0853  2264
    0000004E'EF     00F26010 9F  D0  0853  2265          MOVL     @#A_UBI_CSR,L_SAVE_CSR            ; save UBI CSR
                                     085E  2266          $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-        ; report no-RDY error
                                     085E  2267                           MSGADR=T_MAP_SEL_ERR,-
                                     085E  2268                           PRLINK=XFER_ERR
               00001420'EF       DF  085E                    PUSHAL   XFER_ERR
               000005B0'EF       DF  0864                    PUSHAL   T_MAP_SEL_ERR
               00000000'EF       DD  086A                    PUSHL    BEO_UNIT_NO
                        01       DD  0870                    PUSHL    #$ER
                                     0872       ;;; TEST 8, SUBTEST 8, ERROR 1
          000100D0 9F      04    FB  0872                    CALLS    #$$M, @#DS$ERRHARD
                                     0879  2269
                                     0879  2270          $DS_ABORT        TEST                      ; abort test
                        50       D4  0879                    CLRL     R0                  ; SEND A WARNING TO THE SUPERVISOR
                        04           087B                    RET                          ; TERMINATE TEST
                                     087C  2271 ;
                                     087C  2272 ; Initiate DATI transaction, wait
                                     087C  2273 ;
               00001850'EF 16        087C  2274 4$:      JSB      UBE_SET_UP                        ; execute DATI
                                     0882  2275          $DS_WAITMS_S     TIME=#1                   ; wait
                        00       DD  0882                    PUSHL    #0
                        01       DD  0884                    PUSHL    #1
          00010060 9F      02    FB  0886                    CALLS    #2, @#DS$WAITMS
                                     088D  2276 ;
                                     088D  2277 ; Check for execution or data errors, report if any
                                     088D  2278 ;
    0000004E'EF     00F26010 9F  D0  088D  2279          MOVL     @#A_UBI_CSR,L_SAVE_CSR            ; save UBI CSR
             01     000002AF'FF  B1  0898  2280          CMPW     @A_BEO_DB,#1                      ; check UBE Data register
                           12    13  089F  2281          BEQL     5$                                ; br = no data error
      00000000'EF      1000 8F   A8  08A1  2282          BISW2    #M_DATA_ERR,W_FLAGS               ; set data error flag
             52     000002AF'FF  3C  08AA  2283          MOVZWL   @A_BEO_DB,R2                      ; extend actual data
                           15    11  08B1  2284          BRB      6$                                ; br to error report
    0000004E'EF     8001C000 8F  D3  08B3  2285 5$:      BITL     #M_UBI_STS,L_SAVE_CSR             ; check UBI status
                           08    12  08BE  2286          BNEQ     6$                                ; br = UBI error
        33 000002BF'FF     0F    E1  08C0  2287          BBC      #V_ERR,@A_BEO_CR1,7$              ; br = no UBE error
                                     08C8  2288
                                     08C8  2289 6$:      $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-        ; report data error
                                     08C8  2290                           MSGADR=T_MAP_SEL_ERR,-
                                     08C8  2291                           PRLINK=XFER_ERR,-
                                     08C8  2292                           P1=A_BEO_DB,-             ; location
                                     08C8  2293                           P2=#1,-                   ; expected value
                                     08C8  2294                           P3=R2,-                   ; actual value
                                     08C8  2295                           P4=#T_WORD_ERR,-          ; data type
                                     08C8  2296                           P5=R4                     ; map number used
                        54       DD  08C8                    PUSHL    R4
               00000DA0'8F       DD  08CA                    PUSHL    #T_WORD_ERR
                        52       DD  08D0                    PUSHL    R2
                        01       DD  08D2                    PUSHL    #1
               000002AF'EF       DD  08D4                    PUSHL    A_BEO_DB
               00001420'EF       DF  08DA                    PUSHAL   XFER_ERR
               000005B0'EF       DF  08E0                    PUSHAL   T_MAP_SEL_ERR
               00000000'EF       DD  08E6                    PUSHL    BEO_UNIT_NO
                        02       DD  08EC                    PUSHL    #$ER
                                     08EE       ;;; TEST 8, SUBTEST 8, ERROR 2
          000100D0 9F      09    FB  08EE                    CALLS    #$$M, @#DS$ERRHARD
```

```
                             08F5  2297
       00000000'EF      B4   08F5  2298            CLRW    W_FLAGS                          ; clear flags word
                             08FB  2299 7$:        $DS_CKLOOP      2$                       ; scope loop at 2$
 00010040 9F    FF23 CF  FA  08FB                          CALLG   2$, @#DS$CKLOOP
                             0904  2300
      00F26800 9F44     D4   0904  2301            CLRL    @#A_MAP_BGN[R4]                  ; invalidate Map Entry
       54    54   01    78   090B  2302            ASHL    #1,R4,R4                         ; float one to next address bit
                  02    12   090F  2303            BNEQ    9$                               ; br = index not 0
                  54    D6   0911  2304            INCL    R4                               ; load one into index
     00000200 8F  54    D1   0913  2305 9$:        CMPL    R4,#512                          ; done ?
                  03    13   091A  2306            BEQL    10$                              ; br = done
                FEF8    31   091C  2307            BRW     1$                               ; br = not done
                             091F  2308 10$:
                             091F  2309            $DS_ENDSUB
                             091F       T8_S8_X:
 00010038 9F    00000054'EF  FA  091F                      CALLG   $S$, @#DS$ENDSUB
                             092A  2310
                             092A  2311            $DS_PAGE
                             092A  2312

                             092A                  .SBTTL  SUBTEST 8.9:  DATI 2
                             092A  2314 ;+
                             092A  2315 ; Subtest description:
                             092A  2316 ;
                             092A  2317 ;          This subtest checks the ability of the UBI to perform a DATI
                             092A  2318 ;          transaction and the integrity of the data path.  The transactions are
                             092A  2319 ;          made from longword and word aligned addresses.  The following data
                             092A  2320 ;          patterns are used:
                             092A  2321 ;
                             092A  2322 ;                  0101010101010101
                             092A  2323 ;                  1010101010101010
                             092A  2324 ;                  0011001100110011
                             092A  2325 ;                  0000111100001111
                             092A  2326 ;                  0000000011111111
                             092A  2327 ;
                             092A  2328 ; Subtest steps:
                             092A  2329 ;
                             092A  2330 ;          SUBTEST DATI 2
                             092A  2331 ;          :  Invalidate all maps but one
                             092A  2332 ;          :  DO for Alignment = {longword,word}
                             092A  2333 ;          :  :  REPEAT
                             092A  2334 ;          :  :  :  EXECUTE DATI
                             092A  2335 ;          :  :  :  WAIT
                             092A  2336 ;          :  :  :  IF error
                             092A  2337 ;          :  :  :  :  THEN REPORT error
                             092A  2338 ;          :  :  :  ENDIF
                             092A  2339 ;          :  :  : UNTIL patterns exhausted
                             092A  2340 ;          :  :  ENDREPEAT
                             092A  2341 ;          :  ENDDO
                             092A  2342 ;          ENDSUBTEST DATI 2
                             092A  2343 ;
                             092A  2344 ; Errors:
                             092A  2345 ;
                             092A  2346 ;-
                             092A  2347            $DS_BGNSUB
                             092A       T8_S9::
 00010030 9F    00000060'EF  FA  092A                      CALLG   $S$, @#DS$BGNSUB
```

```
                  37   00   DA  0935  2349          MTPR    #0,#PR$L_UB_INIT                    ; initialize Unibus devices
            00000000'EF     B4  0938  2350          CLRW    W_FLAGS                             ; clear flags word
            00000000'FF     D4  093E  2351          CLRL    @A_UBE_BUFFER_0                     ; clear buffer longword
                                0944  2352 ;
                                0944  2353 ; Invalidate all Map Entries except the first usable one.
                                0944  2354 ;
            000018FB'EF     16  0944  2355          JSB     INVAL_MAPS                          ; invalidate all maps
        52  00000002'EF     D0  094A  2356          MOVL    FRST_VAL_MAP,R2                     ; load No of first valid Map
 00F26800 9F42  0000004A'EF D0  0951  2357          MOVL    L_PAGE_NO,@#A_MAP_BGN[R2]           ; load PFN into Map Entry
 00F26800 9F42  80000000 8F C8  095D  2358          BISL2   #M_MAP_VAL,@#A_MAP_BGN[R2]          ; validate Map Entry
                                0969  2359
        55  0000029F'EF     3E  0969  2360 10$:     MOVAW   W_PTRN_TBL,R5                       ; load pattern table address
                                0970  2361 ;
                                0970  2362 ; Load address into DATI command table
                                0970  2363 ;
        59  000002CB'EF     3E  0970  2364 30$:     MOVAW   UBE_DATI_1,R9                       ; load command table address
               06 A9   56   B0  0977  2365          MOVW    R6,6(R9)                            ; load offset within page
 06 A9    09   09  00000002'EF  F0  097B  2366      INSV    FRST_VAL_MAP,#9,#9,6(R9)            ; load Map Number
                                0985  2367
                                0985  2368 ;
                                0985  2369 ; If ready bit not set then report error and abort test
                                0985  2370 ;
      29 000002BF'FF   07   E0  0985  2371 40$:     BBS     #V_RDY,@A_BEO_CR1,50$               ; br = ready bit set
                                098D  2372
  0000004E'EF   00F26010 9F D0  098D  2373          MOVL    @#A_UBI_CSR,L_SAVE_CSR              ; save UBI CSR
                                0998  2374          $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-          ; report no-RDY error
                                0998  2375                          MSGADR=T_D_PATH_ERR,-
                                0998  2376                          PRLINK=XFER_ERR
            00001420'EF     DF  0998                    PUSHAL  XFER_ERR
            0000058E'EF     DF  099E                    PUSHAL  T_D_PATH_ERR
            00000000'EF     DD  09A4                    PUSHL   BEO_UNIT_NO
                    01      DD  09AA                    PUSHL   #$ER
                                09AC           ;;; TEST 8, SUBTEST 9, ERROR 1
       000100D0 9F  04      FB  09AC                    CALLS   #$$M, @#DS$ERRHARD
                                09B3  2377
                                09B3  2378          $DS_ABORT       TEST                        ; abort test
                    50      D4  09B3                    CLRL    R0                  ; SEND A WARNING TO THE SUPERVISOR
                    04          09B5                    RET                         ; TERMINATE TEST
                                09B6  2379 ;
                                09B6  2380 ; Execute DATI, wait
                                09B6  2381 ;
                  66   65   B0  09B6  2382 50$:     MOVW    (R5),(R6)                           ; load pattern
            00001850'EF     16  09B9  2383          JSB     UBE_SET_UP                          ; execute DATI
                                09BF  2384          $DS_WAITMS_S    TIME=#1                     ; wait 1 msec
                       00   DD  09BF                    PUSHL   #0
                       01   DD  09C1                    PUSHL   #1
       00010060 9F     02   FB  09C3                    CALLS   #2, @#DS$WAITMS
                                09CA  2385 ;
                                09CA  2386 ; Check for execution errors, report if any
                                09CA  2387 ;
  0000004E'EF   00F26010 9F D0  09CA  2388          MOVL    @#A_UBI_CSR,L_SAVE_CSR              ; save UBI CSR
        65  000002AF'FF     B1  09D5  2389          CMPW    @A_BEO_DB,(R5)                      ; check UBE data register
                       12   13  09DC  2390          BEQL    60$                                 ; br = no data error
   00000000'EF     1000 8F  A8  09DE  2391          BISW2   #M_DATA_ERR,W_FLAGS                 ; set data error flag
        52  000002AF'FF     3C  09E7  2392          MOVZWL  @A_BEO_DB,R2                        ; extend actual data
                       15   11  09EE  2393          BRB     70$                                 ; br to error report
  0000004E'EF   8001C000 8F D3  09F0  2394 60$:     BITL    #M_UBI_STS,L_SAVE_CSR               ; check UBI status bits
```

```
                   08   12  09FB  2395          BNEQ    70$                           ; br = UBI error
       37 000002BF'FF   0F   E1  09FD  2396          BBC     #V_ERR,@A_BEO_CR1,75$         ; br = no UBE errors
                            0A05  2397
                            0A05  2398 70$:     $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-        ; report data error
                            0A05  2399                           MSGADR=T_D_PATH_ERR,-
                            0A05  2400                           PRLINK=XFER_ERR,-
                            0A05  2401                           P1=A_BEO_DB,-              ; location
                            0A05  2402                           P2=(R5),-                  ; expected value
                            0A05  2403                           P3=R2,-                    ; actual value
                            0A05  2404                           P4=#T_WORD_ERR,-           ; data type
                            0A05  2405                           P5=FRST_VAL_MAP            ; map number used
          00000002'EF   DD  0A05                  PUSHL   FRST_VAL_MAP
          00000DA0'8F   DD  0A0B                  PUSHL   #T_WORD_ERR
                   52   DD  0A11                  PUSHL   R2
                   65   DD  0A13                  PUSHL   (R5)
          000002AF'EF   DD  0A15                  PUSHL   A_BEO_DB
          00001420'EF   DF  0A1B                  PUSHAL  XFER_ERR
          0000058E'EF   DF  0A21                  PUSHAL  T_D_PATH_ERR
          00000000'EF   DD  0A27                  PUSHL   BEO_UNIT_NO
                   02   DD  0A2D                  PUSHL   #$ER
                            0A2F          ;;; TEST 8, SUBTEST 9, ERROR 2
     000100D0 9F   09   FB  0A2F                  CALLS   #$$M, @#DS$ERRHARD
                            0A36  2406
          00000000'EF   B4  0A36  2407          CLRW    W_FLAGS                       ; clear flags word
                            0A3C  2408 75$:     $DS_CKLOOP      30$                   ; scope loop at 30$
  00010040 9F     FF30 CF   FA  0A3C                  CALLG   30$, @#DS$CKLOOP
                            0A45  2409 ;
                            0A45  2410 ; Adjust pointer and end subtest if patterns exhausted and both longword- and
                            0A45  2411 ; word-aligned cases have been tested.
                            0A45  2412 ;
          00FF 8F   85   B1  0A45  2413 80$:     CMPW    (R5)+,#^X00FF                 ; patterns exhausted?
                   03   13  0A4A  2414          BEQL    90$                           ; br = patterns exhausted
                 FF21   31  0A4C  2415          BRW     30$                           ; br = patterns not exhausted
             03 56   01   E2  0A4F  2416 90$:     BBSS    #1,R6,100$                    ; br = done for word alignment
                 FF13   31  0A53  2417          BRW     10$                           ; br, repeat for word alignment
                            0A56  2418 100$:
                            0A56  2419          $DS_ENDSUB
                            0A56          T8_S9_X:
 00010038 9F    00000060'EF   FA  0A56                  CALLG   $S$, @#DS$ENDSUB
                            0A61  2420
                            0A61  2421          $DS_PAGE
```

```
                              0A61               .SBTTL  SUBTEST 8.10:  DATO
                              0A61   2424 ;+
                              0A61   2425 ; Subtest description:
                              0A61   2426 ;
                              0A61   2427 ;        This subtest checks the ability of the UBI to perform a DATO
                              0A61   2428 ;        transaction. This test is similar to the DATI 2 subtest, with
                              0A61   2429 ;        the data transfer in the opposite direction.
                              0A61   2430 ;
                              0A61   2431 ; Subtest steps:
                              0A61   2432 ;
                              0A61   2433 ;        SUBTEST DATO
                              0A61   2434 ;        :  Load UBE address registers
                              0A61   2435 ;        :  DO FOR Alignment = {word, longword}
                              0A61   2436 ;        :  :  REPEAT
                              0A61   2437 ;        :  :  :  EXECUTE DATO
                              0A61   2438 ;        :  :  :  WAIT
                              0A61   2439 ;        :  :  :  IF error
                              0A61   2440 ;        :  :  :  :  THEN REPORT error
                              0A61   2441 ;        :  :  :  ENDIF
                              0A61   2442 ;        :  :  : UNTIL patterns exhausted
                              0A61   2443 ;        :  :  ENDREPEAT
                              0A61   2444 ;        :  ENDDO
                              0A61   2445 ;        ENDSUBTEST DATO
                              0A61   2446 ;
                              0A61   2447 ; Errors:
                              0A61   2448 ;
                              0A61   2449 ;-
                              0A61   2450                $DS_BGNSUB
                              0A61        T8_S10::
    00010030 9F   0000006C'EF   FA   0A61                        CALLG   $S$, @#DS$BGNSUB
                              0A6C   2451
               37   00   DA   0A6C   2452                MTPR    #0,#PR$L_UB_INIT                 ; initialize Unibus devices
            00000000'EF   B4   0A6F   2453                CLRW    W_FLAGS                          ; clear flags word
       56   00000000'EF   D0   0A75   2454                MOVL    A_UBE_BUFFER_0,R6                ; load memory loc address
            00000000'FF   D4   0A7C   2455                CLRL    @A_UBE_BUFFER_0                  ; clear buffer longword
       55   0000029F'EF   3E   0A82   2456 0$:           MOVAW   W_PTRN_TBL,R5                    ; load pattern table address
                              0A89   2457 ;
                              0A89   2458 ; Load address and data into command table
                              0A89   2459 ;
     0000005E'EF    65    B0   0A89   2460 10$:          MOVW    (R5),L_EXP_DATA                  ; load pattern
          59   000002EF'EF   DE   0A90   2461 15$:          MOVAL   UBE_DATO_1,R9                    ; load command table address
       02 A9   0000005E'EF   B0   0A97   2462                MOVW    L_EXP_DATA,2(R9)                 ; load data
               06 A9    56   B0   0A9F   2463                MOVW    R6,6(R9)                         ; load offset within page
06 A9    09    09   00000002'EF   F0   0AA3   2464                INSV    FRST_VAL_MAP,#9,#9,6(R9)         ; load Map Number
                         66   B4   0AAD   2465                CLRW    (R6)                             ; clear buffer
                              0AAF   2466
                              0AAF   2467 ;
                              0AAF   2468 ; If ready bit not set then report error and abort test
                              0AAF   2469 ;
     29 000002BF'FF    07    E0   0AAF   2470 20$:          BBS     #V_RDY,@A_BE0_CR1,30$            ; br = ready bit set
                              0AB7   2471
 0000004E'EF    00F26010 9F   D0   0AB7   2472                MOVL    @#A_UBI_CSR,L_SAVE_CSR           ; save UBI CSR
                              0AC2   2473                $DS_ERRHARD_S   UNIT=BE0_UNIT_NO,-      ; report no-RDY error
                              0AC2   2474                                MSGADR=T_DATO_ERR,-
                              0AC2   2475                                PRLINK=XFER_ERR
            00001420'EF   DF   0AC2                        PUSHAL  XFER_ERR
            0000061E'EF   DF   0AC8                        PUSHAL  T_DATO_ERR
```

```
               00000000'EF   DD  0ACE                    PUSHL   BEO_UNIT_NO
                        01   DD  0AD4                    PUSHL   #$ER
                                 0AD6        ;;; TEST 8, SUBTEST 10, ERROR 1
          000100D0 9F   04   FB  0AD6                    CALLS   #$$M, @#DS$ERRHARD
                                 0ADD  2476
                                 0ADD  2477        $DS_ABORT       TEST                          ; abort
                        50   D4  0ADD                    CLRL    R0                    ; SEND A WARNING TO THE SUPERVISOR
                             04  0ADF                    RET                           ; TERMINATE TEST
                                 0AE0  2478 ;
                                 0AE0  2479 ; Execute DATO, wait
                                 0AE0  2480 ;
               00001850'EF   16  0AE0  2481 30$:   JSB     UBE_SET_UP                            ; execute DATO
                                 0AE6  2482        $DS_WAITMS_S    TIME=#1                       ; wait
                        00   DD  0AE6                    PUSHL   #0
                        01   DD  0AE8                    PUSHL   #1
          00010060 9F   02   FB  0AEA                    CALLS   #2, @#DS$WAITMS
                                 0AF1  2483 ;
                                 0AF1  2484 ; Check for data or execution errors, report if any
                                 0AF1  2485 ;
 0000004E'EF    00F26010 9F  D0  0AF1  2486        MOVL    @#A_UBI_CSR,L_SAVE_CSR                ; save UBI CSR contents
          66    0000005E'EF  B1  0AFC  2487        CMPW    L_EXP_DATA,(R6)                       ; check UBE data register
                        0B   13  0B03  2488        BEQL    40$                                   ; br = no data error
     00000000'EF    1000 8F  A8  0B05  2489        BISW2   #M_DATA_ERR,W_FLAGS                   ; set data error flag
                        15   11  0B0E  2490        BRB     50$                                   ; br to error report
 0000004E'EF    8001C000 8F  D3  0B10  2491 40$:   BITL    #M_UBI_STS,L_SAVE_CSR                 ; check UBI status bits
                        08   12  0B1B  2492        BNEQ    50$                                   ; br = UBI error
       37 000002BF'FF   0F   E1  0B1D  2493        BBC     #V_ERR,@A_BEO_CR1,55$                 ; br = no UBE errors
                                 0B25  2494
                                 0B25  2495 50$:   $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-            ; report data error
                                 0B25  2496                        MSGADR=T_DATO_ERR,-
                                 0B25  2497                        PRLINK=XFER_ERR,-
                                 0B25  2498                        P1=R6,-                       ; location
                                 0B25  2499                        P2=L_EXP_DATA,-               ; expected value
                                 0B25  2500                        P3=(R6),-                     ; actual value
                                 0B25  2501                        P4=#T_WORD_ERR,-              ; data type
                                 0B25  2502                        P5=FRST_VAL_MAP               ; map number used
               00000002'EF   DD  0B25                    PUSHL   FRST_VAL_MAP
               00000DA0'8F   DD  0B2B                    PUSHL   #T_WORD_ERR
                        66   DD  0B31                    PUSHL   (R6)
               0000005E'EF   DD  0B33                    PUSHL   L_EXP_DATA
                        56   DD  0B39                    PUSHL   R6
               00001420'EF   DF  0B3B                    PUSHAL  XFER_ERR
               0000061E'EF   DF  0B41                    PUSHAL  T_DATO_ERR
               00000000'EF   DD  0B47                    PUSHL   BEO_UNIT_NO
                        02   DD  0B4D                    PUSHL   #$ER
                                 0B4F        ;;; TEST 8, SUBTEST 10, ERROR 2
          000100D0 9F   09   FB  0B4F                    CALLS   #$$M, @#DS$ERRHARD
                                 0B56  2503
               00000000'EF   B4  0B56  2504        CLRW    W_FLAGS                               ; clear flags word
                                 0B5C  2505 55$:   $DS_CKLOOP      15$                           ; scope loop at 15$
   00010040 9F    FF30 CF    FA  0B5C                    CALLG   15$, @#DS$CKLOOP
                                 0B65  2506 ;
                                 0B65  2507 ; Adjust pointer and end subtest if patterns exhausted and both longword- and
                                 0B65  2508 ; word-aligned cases have been tested.
                                 0B65  2509 ;
           0F0F 8F      85   B1  0B65  2510 60$:   CMPW    (R5)+,#^X0F0F                         ; patterns exhausted?
                        03   13  0B6A  2511        BEQL    80$                                   ; br = patterns exhausted
```

```
                  FF1A   31  0B6C  2512              BRW     10$                           ; br = patterns not exhausted
           03 56    01   E2  0B6F  2513 80$:         BBSS    #1,R6,100$                    ; br = done for word alignment
                  FF0C   31  0B73  2514              BRW     0$                            ; br, repeat for word alignment
                             0B76  2515 100$:
                             0B76  2516
                             0B76  2517              $DS_ENDSUB
                             0B76        T8_S10_X:
     00010038 9F    0000006C'EF    FA  0B76                          CALLG   $S$, @#DS$ENDSUB
                             0B81  2518
                             0B81  2519              $DS_PAGE
```

```
                                  0B81              .SBTTL  SUBTEST 8.11:  DATOB
                                  0B81   2522 ;+
                                  0B81   2523 ; Subtest description:
                                  0B81   2524 ;
                                  0B81   2525 ;          This subtest checks the ability of the UBI to perform a DATOB transac-
                                  0B81   2526 ;          tion.  The transactions are made from longword- and word-aligned main
                                  0B81   2527 ;          memory addresses.  The following data patterns are used:
                                  0B81   2528 ;
                                  0B81   2529 ;                  01010101
                                  0B81   2530 ;                  10101010
                                  0B81   2531 ;                  00110011
                                  0B81   2532 ;                  00001111
                                  0B81   2533 ;
                                  0B81   2534 ; Subtest steps:
                                  0B81   2535 ;
                                  0B81   2536 ;          SUBTEST DATOB
                                  0B81   2537 ;          :  DO FOR Alignment = {word, longword}
                                  0B81   2538 ;          :  CLEAR Main Memory location
                                  0B81   2539 ;          :  :  REPEAT
                                  0B81   2540 ;          :  :  :  Load pattern into UBE Data Register
                                  0B81   2541 ;          :  :  :  Initiate DATOB
                                  0B81   2542 ;          :  :  :  WAIT
                                  0B81   2543 ;          :  :  :  IF error
                                  0B81   2544 ;          :  :  :  :  THEN REPORT error
                                  0B81   2545 ;          :  :  :  ENDIF
                                  0B81   2546 ;          :  :  : UNTIL patterns exhausted
                                  0B81   2547 ;          :  :  ENDREPEAT
                                  0B81   2548 ;          :  ENDDO
                                  0B81   2549 ;          ENDSUBTEST DATOB
                                  0B81   2550 ;
                                  0B81   2551 ; Errors:
                                  0B81   2552 ;
                                  0B81   2553 ;-
                                  0B81   2554           $DS_BGNSUB
                                  0B81         T8_S11::
   00010030 9F   00000078'EF   FA 0B81                  CALLG   $S$, @#DS$BGNSUB
                                  0B8C   2555
               37   00         DA 0B8C   2556           MTPR    #0,#PR$L_UB_INIT                ; initialize Unibus devices
              00000000'EF      B4 0B8F   2557           CLRW    W_FLAGS                         ; clear flags word
              00000000'FF      D4 0B95   2558           CLRL    @A_UBE_BUFFER_0                 ; clear buffer longword
         56   00000000'EF      D0 0B9B   2559           MOVL    A_UBE_BUFFER_0,R6               ; load memory loc address
                        66     B4 0BA2   2560           CLRW    (R6)                            ; clear main memory location
              0000005E'EF      D4 0BA4   2561           CLRL    L_EXP_DATA                      ; clear expected data
         55   0000029F'EF      3E 0BAA   2562 10$:      MOVAW   W_PTRN_TBL,R5                   ; load pattern table address
                                  0BB1   2563 ;
                                  0BB1   2564 ; Load data and address into DATOB command table
                                  0BB1   2565 ;
        0000005E'EF     65     90 0BB1   2566 30$:      MOVB    (R5),L_EXP_DATA                 ; load expected data
                        66     B4 0BB8   2567           CLRW    (R6)                            ; clear destination
         59   000002E3'EF      DE 0BBA   2568           MOVAL   UBE_DATOB_1,R9                  ; load command table address
               02 A9    65     B0 0BC1   2569           MOVW    (R5),2(R9)                      ; load data pattern
               06 A9    56     B0 0BC5   2570           MOVW    R6,6(R9)                        ; load offset within page
 06 A9    09    09  00000002'EF F0 0BC9  2571           INSV    FRST_VAL_MAP,#9,#9,6(R9)        ; load Map Number
                                  0BD3   2572 ;
                                  0BD3   2573 ; If ready bit not set then report error and abort test
                                  0BD3   2574 ;
      29 000002BF'FF    07     E0 0BD3   2575 40$:      BBS     #V_RDY,@A_BEO_CR1,50$           ; br = ready bit set
```

```
                                   0BDB  2576
  0000004E'EF    00F26010 9F  D0   0BDB  2577           MOVL    @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
                                   0BE6  2578           $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-       ; report no-RDY error
                                   0BE6  2579                           MSGADR=T_DATOB_ERR,-
                                   0BE6  2580                           PRLINK=XFER_ERR
               00001420'EF    DF   0BE6                         PUSHAL  XFER_ERR
               000005FB'EF    DF   0BEC                         PUSHAL  T_DATOB_ERR
               00000000'EF    DD   0BF2                         PUSHL   BEO_UNIT_NO
                        01    DD   0BF8                         PUSHL   #SER
                                   0BFA          ;;; TEST 8, SUBTEST 11, ERROR 1
         000100D0 9F    04    FB   0BFA                         CALLS   #$$M, @#DS$ERRHARD
                                   0C01  2581
                                   0C01  2582           $DS_ABORT               TEST                    ; abort test
                        50    D4   0C01                         CLRL    R0                ; SEND A WARNING TO THE SUPERVISOR
                        04         0C03                         RET                       ; TERMINATE TEST
                                   0C04  2583 ;
                                   0C04  2584 ; Execute DATOB, wait
                                   0C04  2585 ;
               00001850'EF    16   0C04  2586 50$:      JSB     UBE_SET_UP                      ; execute DATOB
                                   0C0A  2587           $DS_WAITMS_S    TIME=#1                 ; wait
                        00    DD   0C0A                         PUSHL   #0
                        01    DD   0C0C                         PUSHL   #1
         00010060 9F    02    FB   0C0E                         CALLS   #2, @#DS$WAITMS
                                   0C15  2588 ;
                                   0C15  2589 ; Check for data or execution errors, report if any.
                                   0C15  2590 ;
  0000004E'EF    00F26010 9F  D0   0C15  2591           MOVL    @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
           66    0000005E'EF  91   0C20  2592           CMPB    L_EXP_DATA,(R6)                 ; check data sent
                        0B    13   0C27  2593           BEQL    60$                             ; br = no data error
     00000000'EF      1000 8F  A8   0C29  2594           BISW2   #M_DATA_ERR,W_FLAGS             ; set data error flag
                        15    11   0C32  2595           BRB     70$                             ; br to error report
  0000004E'EF    8001C000 8F  D3   0C34  2596 60$:      BITL    #M_UBI_STS,L_SAVE_CSR           ; check UBI status bits
                        08    12   0C3F  2597           BNEQ    70$                             ; br = UBI error
       37 000002BF'FF    0F    E1   0C41  2598           BBC     #V_ERR,@A_BEO_CR1,75$           ; br = no UBE errors
                                   0C49  2599
                                   0C49  2600 70$:      $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-       ; report data error
                                   0C49  2601                           MSGADR=T_DATOB_ERR,-
                                   0C49  2602                           PRLINK=XFER_ERR,-
                                   0C49  2603                           P1=R6,-                 ; location
                                   0C49  2604                           P2=L_EXP_DATA,-         ; expected value
                                   0C49  2605                           P3=(R6),-               ; actual value
                                   0C49  2606                           P4=#T_BYTE_ERR,-        ; data type
                                   0C49  2607                           P5=FRST_VAL_MAP         ; map number used
               00000002'EF    DD   0C49                         PUSHL   FRST_VAL_MAP
               00000D72'8F    DD   0C4F                         PUSHL   #T_BYTE_ERR
                        66    DD   0C55                         PUSHL   (R6)
               0000005E'EF    DD   0C57                         PUSHL   L_EXP_DATA
                        56    DD   0C5D                         PUSHL   R6
               00001420'EF    DF   0C5F                         PUSHAL  XFER_ERR
               000005FB'EF    DF   0C65                         PUSHAL  T_DATOB_ERR
               00000000'EF    DD   0C6B                         PUSHL   BEO_UNIT_NO
                        02    DD   0C71                         PUSHL   #SER
                                   0C73          ;;; TEST 8, SUBTEST 11, ERROR 2
         000100D0 9F    09    FB   0C73                         CALLS   #$$M, @#DS$ERRHARD
                                   0C7A  2608
               00000000'EF    B4   0C7A  2609           CLRW    W_FLAGS                         ; clear flags word
                                   0C80  2610 75$:      $DS_CKLOOP      30$                     ; scope loop at 30$
```

```
      00010040 9F    FF2D CF    FA  0C80                    CALLG   30$, @#DS$CKLOOP
                                    0C89   2611 ;
                                    0C89   2612 ; Adjust pointer and end subtest if patterns exhausted and both longword- and
                                    0C89   2613 ; word-aligned cases have been tested.
                                    0C89   2614 ;
             0F0F 8F      85    B1  0C89   2615 80$:     CMPW    (R5)+,#^X0F0F                    ; patterns exhausted ?
                          03    13  0C8E   2616          BEQL    90$                              ; br = patterns exhausted
                        FF1E    31  0C90   2617          BRW     30$                              ; br = patterns not exhausted
                03 56     01    E2  0C93   2618 90$:     BBSS    #1,R6,100$                       ; br = done for word alignment
                        FF10    31  0C97   2619          BRW     10$                              ; br, repeat for word alignment
                                    0C9A   2620 100$:
                                    0C9A   2621          $DS_ENDSUB
                                    0C9A        T8_S11_X:
   00010038 9F    00000078'EF   FA  0C9A                    CALLG   $S$, @#DS$ENDSUB
                                    0CA5   2622
                                    0CA5   2623          $DS_PAGE
```

```
                                        0CA5          .SBTTL  SUBTEST 8.12:  DATIP/DATO
                                        0CA5     ;+
                                        0CA5     ; Subtest description:
                                        0CA5     ;
                                        0CA5     ;       This subtest checks the ability of the UBI to perform a DATIP/DATO
                                        0CA5     ;       transaction. This test is similar to the DATI 2 subtest, with
                                        0CA5     ;       the addition of checking that the DATO portion of the transaction also
                                        0CA5     ;       works.
                                        0CA5     ;
                                        0CA5     ; Subtest steps:
                                        0CA5     ;
                                        0CA5     ;       SUBTEST DATIP/DATO
                                        0CA5     ;       :  Invalidate all maps but one
                                        0CA5     ;       :  Load UBE address registers
                                        0CA5     ;       :  DO FOR Alignment = {word, longword}
                                        0CA5     ;       :  :  REPEAT
                                        0CA5     ;       :  :  :  EXECUTE DATIP/DATO
                                        0CA5     ;       :  :  :  WAIT
                                        0CA5     ;       :  :  :  IF error
                                        0CA5     ;       :  :  :  :  THEN REPORT error
                                        0CA5     ;       :  :  :  ENDIF
                                        0CA5     ;       :  :  : UNTIL patterns exhausted
                                        0CA5     ;       :  :  ENDREPEAT
                                        0CA5     ;       :  ENDDO
                                        0CA5     ;       ENDSUBTEST DATIP/DATO
                                        0CA5     ;
                                        0CA5     ; Errors:
                                        0CA5     ;
                                        0CA5     ;-
                                        0CA5             $DS_BGNSUB
                                        0CA5     T8_S12::
  00010030 9F   00000084'EF     FA      0CA5                     CALLG   $S$, @#DS$BGNSUB
                                        0CB0
            37   00             DA      0CB0             MTPR    #0,#PR$L_UB_INIT                ; initialize Unibus devices
            00000000'EF         B4      0CB3             CLRW    W_FLAGS                         ; clear flags word
            00000000'FF         7C      0CB9             CLRQ    @A_UBE_BUFFER_0                 ; clear buffer quadword
        56  00000000'EF         D0      0CBF             MOVL    A_UBE_BUFFER_0,R6               ; load memory loc address
                                        0CC6     ;
                                        0CC6     ; Set up first valid Map Entry.
                                        0CC6     ;
        52  00000002'EF         D0      0CC6             MOVL    FRST_VAL_MAP,R2                 ; load No of first valid Map
  00F26800 9F42 0000004A'EF     D0      0CCD             MOVL    L_PAGE_NO,@#A_MAP_BGN[R2]       ; load PFN into Map Entry
  00F26800 9F42 80000000 8F     C8      0CD9             BISL2   #M_MAP_VAL,@#A_MAP_BGN[R2]      ; validate Map Entry
        55  0000029F'EF         3E      0CE5     0$:     MOVAW   W_PTRN_TBL,R5                   ; load pattern table address
                                        0CEC     ;
                                        0CEC     ; Load address into command table and load expected value
                                        0CEC     ;
            66   65             B0      0CEC     10$:    MOVW    (R5),(R6)                       ; load pattern
      0000005E'EF   66   01     9C      0CEF             ROTL    #1,(R6),L_EXP_DATA              ; load expected data
  54  0000005E'EF   01   10     EF      0CF7             EXTZV   #16,#1,L_EXP_DATA,R4            ; extract end-around carry bit
         0000005E'EF   54       C8      0D00             BISL2   R4,L_EXP_DATA                   ; insert carry bit
        59  000002D7'EF         DE      0D07             MOVAL   UBE_DATIP_1,R9                  ; load command table address
            06 A9   56          B0      0D0E             MOVW    R6,6(R9)                        ; load offset within page
 06 A9   09   09  00000002'EF   F0      0D12             INSV    FRST_VAL_MAP,#9,#9,6(R9)        ; load Map Number
                                        0D1C
                                        0D1C     ;
                                        0D1C     ; If ready bit not set then report error and abort test
```

```
                                     0D1C   2680 ;
         29 000002BF'FF       07    E0  0D1C   2681 20$:    BBS     #V_RDY,@A_BE0_CR1,30$            ; br = ready bit set
                                     0D24   2682
    0000004E'EF    00F26010 9F    D0  0D24   2683         MOVL    @#A_UBI_CSR,L_SAVE_CSR            ; save UBI CSR
                                     0D2F   2684         $DS_ERRHARD_S   UNIT=BE0_UNIT_NO,-       ; report no-RDY error
                                     0D2F   2685                         MSGADR=T_DATIP_ERR,-
                                     0D2F   2686                         PRLINK=XFER_ERR
                 00001420'EF    DF  0D2F                   PUSHAL  XFER_ERR
                 000005D3'EF    DF  0D35                   PUSHAL  T_DATIP_ERR
                 00000000'EF    DD  0D3B                   PUSHL   BE0_UNIT_NO
                          01    DD  0D41                   PUSHL   #$ER
                                     0D43        ;;; TEST 8, SUBTEST 12, ERROR 1
         000100D0 9F      04    FB  0D43                   CALLS   #$$M, @#DS$ERRHARD
                                     0D4A   2687
                                     0D4A   2688         $DS_ABORT       TEST                     ; abort
                          50    D4  0D4A                   CLRL    R0                    ; SEND A WARNING TO THE SUPERVISOR
                          04        0D4C                   RET                           ; TERMINATE TEST
                                     0D4D   2689 ;
                                     0D4D   2690 ; Execute DATIP/DATO, wait
                                     0D4D   2691 ;
                 00001850'EF    16  0D4D   2692 30$:    JSB     UBE_SET_UP                        ; execute DATIP/DATO
                                     0D53   2693         $DS_WAITMS_S    TIME=#1                  ; wait
                          00    DD  0D53                   PUSHL   #0
                          01    DD  0D55                   PUSHL   #1
         00010060 9F      02    FB  0D57                   CALLS   #2, @#DS$WAITMS
                                     0D5E   2694 ;
                                     0D5E   2695 ; Check for DATIP data or execution errors, report if any
                                     0D5E   2696 ;
    0000004E'EF    00F26010 9F    D0  0D5E   2697         MOVL    @#A_UBI_CSR,L_SAVE_CSR            ; save UBI CSR contents
    000002AF'FF    0000005E'EF    B1  0D69   2698         CMPW    L_EXP_DATA,@A_BE0_DB              ; check UBE data register
                          12    13  0D74   2699         BEQL    40$                               ; br = no data error
      00000000'EF     1000 8F    A8  0D76   2700         BISW2   #M_DATA_ERR,W_FLAGS               ; set data error flag
             53    000002AF'FF    3C  0D7F   2701         MOVZWL  @A_BE0_DB,R3                      ; extend actual data
                          15    11  0D86   2702         BRB     50$                               ; br to error report
    0000004E'EF    8001C000 8F    D3  0D88   2703 40$:    BITL    #M_UBI_STS,L_SAVE_CSR             ; check UBI status bits
                          08    12  0D93   2704         BNEQ    50$                               ; br = UBI error
         3B 000002BF'FF   0F    E1  0D95   2705         BBC     #V_ERR,@A_BE0_CR1,60$             ; br = no UBE errors
                                     0D9D   2706
                                     0D9D   2707 50$:    $DS_ERRHARD_S   UNIT=BE0_UNIT_NO,-       ; report data error
                                     0D9D   2708                         MSGADR=T_DATIP_ERR,-
                                     0D9D   2709                         PRLINK=XFER_ERR,-
                                     0D9D   2710                         P1=A_BE0_DB,-            ; location
                                     0D9D   2711                         P2=L_EXP_DATA,-          ; expected value
                                     0D9D   2712                         P3=R3,-                  ; actual value
                                     0D9D   2713                         P4=#T_WORD_ERR,-         ; data type
                                     0D9D   2714                         P5=FRST_VAL_MAP          ; map number used
                 00000002'EF    DD  0D9D                   PUSHL   FRST_VAL_MAP
                 00000DA0'8F    DD  0DA3                   PUSHL   #T_WORD_ERR
                          53    DD  0DA9                   PUSHL   R3
                 0000005E'EF    DD  0DAB                   PUSHL   L_EXP_DATA
                 000002AF'EF    DD  0DB1                   PUSHL   A_BE0_DB
                 00001420'EF    DF  0DB7                   PUSHAL  XFER_ERR
                 000005D3'EF    DF  0DBD                   PUSHAL  T_DATIP_ERR
                 00000000'EF    DD  0DC3                   PUSHL   BE0_UNIT_NO
                          02    DD  0DC9                   PUSHL   #$ER
                                     0DCB        ;;; TEST 8, SUBTEST 12, ERROR 2
         000100D0 9F      09    FB  0DCB                   CALLS   #$$M, @#DS$ERRHARD
```

```
                                   0DD2  2715
          00000000'EF      B4      0DD2  2716           CLRW    W_FLAGS                         ; clear flags word
                                   0DD8  2717 ;
                                   0DD8  2718 ; Check DATO data, if error then report
                                   0DD8  2719 ;
       66   0000005E'EF    B1      0DD8  2720 60$:      CMPW    L_EXP_DATA,(R6)                 ; check data returned
                   40      13      0DDF  2721           BEQL    65$                             ; br = ok
   00000000'EF    1000 8F  A8      0DE1  2722           BISW2   #M_DATA_ERR,W_FLAGS             ; set data error flag
                                   0DEA  2723
                                   0DEA  2724           $DS_ERRHARD_S     UNIT=BEO_UNIT_NO,-    ; report data error
                                   0DEA  2725                             MSGADR=T_DATIP_ERR,-
                                   0DEA  2726                             PRLINK=XFER_ERR,-
                                   0DEA  2727                             P1=R6,-               ; location
                                   0DEA  2728                             P2=L_EXP_DATA,-       ; expected value
                                   0DEA  2729                             P3=(R6),-             ; actual value
                                   0DEA  2730                             P4=#T_WORD_ERR,-      ; data type
                                   0DEA  2731                             P5=FRST_VAL_MAP       ; map number used
          00000002'EF      DD      0DEA                     PUSHL   FRST_VAL_MAP
          00000DA0'8F      DD      0DF0                     PUSHL   #T_WORD_ERR
                   66      DD      0DF6                     PUSHL   (R6)
          0000005E'EF      DD      0DF8                     PUSHL   L_EXP_DATA
                   56      DD      0DFE                     PUSHL   R6
          00001420'EF      DF      0E00                     PUSHAL  XFER_ERR
          000005D3'EF      DF      0E06                     PUSHAL  T_DATIP_ERR
          00000000'EF      DD      0E0C                     PUSHL   BEO_UNIT_NO
                   03      DD      0E12                     PUSHL   #$ER
                                   0E14       ;;; TEST 8, SUBTEST 12, ERROR 3
     000100D0 9F   09      FB      0E14                     CALLS   #$$M, @#DS$ERRHARD
                                   0E1B  2732
          00000000'EF      B4      0E1B  2733           CLRW    W_FLAGS                         ; clear flags word
                                   0E21  2734 65$:      $DS_CKLOOP      10$                     ; scope loop at 10$
   00010040 9F    FEC7 CF  FA      0E21                     CALLG   10$, @#DS$CKLOOP
                                   0E2A  2735 ;
                                   0E2A  2736 ; Adjust pointer and end subtest if patterns exhausted and both longword- and
                                   0E2A  2737 ; word-aligned cases have been tested.
                                   0E2A  2738 ;
          00FF 8F  85      B1      0E2A  2739 70$:      CMPW    (R5)+,#^X00FF                   ; patterns exhausted?
                   03      13      0E2F  2740           BEQL    80$                             ; br = patterns exhausted
                 FEB8      31      0E31  2741           BRW     10$                             ; br = patterns not exhausted
            03 56  01      E2      0E34  2742 80$:      BBSS    #1,R6,100$                      ; br = done for word alignment
                 FEAA      31      0E38  2743           BRW     0$                              ; br, repeat for word alignment
                                   0E3B  2744 100$:
                                   0E3B  2745
                                   0E3B  2746           $DS_ENDSUB
                                   0E3B       T8_S12_X:
   00010038 9F    00000084'EF  FA  0E3B                     CALLG   $S$, @#DS$ENDSUB
                                   0E46  2747
                                   0E46  2748           $DS_PAGE
```

```
                                      0E46              .SBTTL  SUBTEST 8.13:  Address Offset DATI
                                      0E46  2751 ;+
                                      0E46  2752 ; Subtest description:
                                      0E46  2753 ;
                                      0E46  2754 ;          This subtest checks the ability of the UBI to perform a DATI
                                      0E46  2755 ;          transaction in address offset mode.
                                      0E46  2756 ;
                                      0E46  2757 ; Subtest steps:
                                      0E46  2758 ;
                                      0E46  2759 ;          SUBTEST Address Offset DATI
                                      0E46  2760 ;          :  Set Byte offset bit in first valid Map Entry
                                      0E46  2761 ;          :  DO for Alignment = {longword,word}
                                      0E46  2762 ;          :  :  REPEAT
                                      0E46  2763 ;          :  :  :  EXECUTE DATI
                                      0E46  2764 ;          :  :  :  WAIT
                                      0E46  2765 ;          :  :  :  IF Execution error
                                      0E46  2766 ;          :  :  :  :  THEN REPORT error
                                      0E46  2767 ;          :  :  :  ENDIF
                                      0E46  2768 ;          :  :  :  IF Data error
                                      0E46  2769 ;          :  :  :  :  THEN REPORT error
                                      0E46  2770 ;          :  :  :  ENDIF
                                      0E46  2771 ;          :  :  : UNTIL patterns exhausted
                                      0E46  2772 ;          :  :  ENDREPEAT
                                      0E46  2773 ;          :  ENDDO
                                      0E46  2774 ;          ENDSUBTEST Address Offset DATI
                                      0E46  2775 ;
                                      0E46  2776 ; Errors:
                                      0E46  2777 ;
                                      0E46  2778 ;-
                                      0E46  2779            $DS_BGNSUB
                                      0E46       T8_S13::
   00010030 9F    00000090'EF     FA  0E46                      CALLG   $S$, @#DS$BGNSUB
                                      0E51  2780
                        37   00   DA  0E51  2781            MTPR    #0,#PR$L_UB_INIT                ; initialize Unibus devices
                    00000000'EF   B4  0E54  2782            CLRW    W_FLAGS                         ; clear flags word
                    00000000'FF   D4  0E5A  2783            CLRL    @A_UBE_BUFFER_0                 ; clear buffer longword
          56   00000000'EF   01   C1  0E60  2784            ADDL3   #1,A_UBE_BUFFER_0,R6            ; load memory loc address
                                      0E68  2785 ;
                                      0E68  2786 ; Set Byte Offset bit in first valid Map Entry
                                      0E68  2787 ;
          54   00000002'EF        D0  0E68  2788            MOVL    FRST_VAL_MAP,R4                 ; load No of first valid Map
  00F26800 9F44   02000000 8F     C8  0E6F  2789            BISL2   #M_BYTE_OFF,@#A_MAP_BGN[R4]     ; set byte offset bit
          55   0000029F'EF        3E  0E7B  2790 10$:       MOVAW   W_PTRN_TBL,R5                   ; load pattern table address
                                      0E82  2791 ;
                                      0E82  2792 ; Load address into DATI command table
                                      0E82  2793 ;
          59   000002CB'EF        3E  0E82  2794 30$:       MOVAW   UBE_DATI_1,R9                   ; load command table address
              06 A9   56   01     A3  0E89  2795            SUBW3   #1,R6,6(R9)                     ; load offset within page
  06 A9   09   09   00000002'EF   F0  0E8E  2796            INSV    FRST_VAL_MAP,#9,#9,6(R9)        ; load Map Number
                                      0E98  2797 ;
                                      0E98  2798 ; If ready bit not set then report error and abort test
                                      0E98  2799 ;
         29 000002BF'FF   07      E0  0E98  2800 40$:       BBS     #V_RDY,@A_BEO_CR1,50$           ; br = ready bit set
                                      0EA0  2801
  0000004E'EF   00F26010 9F       D0  0EA0  2802            MOVL    @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
                                      0EAB  2803            $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-      ; report no-RDY error
                                      0EAB  2804                            MSGADR=T_AO_DATI_ERR,-
```

```
                                 0EAB                                    PRLINK=XFER_ERR
             00001420'EF    DF   0EAB                          PUSHAL    XFER_ERR
             000006B3'EF    DF   0EB1                          PUSHAL    T_AO_DATI_ERR
             00000000'EF    DD   0EB7                          PUSHL     BEO_UNIT_NO
                      01    DD   0EBD                          PUSHL     #$ER
                                 0EBF           ;;; TEST 8, SUBTEST 13, ERROR 1
       000100D0 9F    04    FB   0EBF                          CALLS     #$$M, @#DS$ERRHARD
                                 0EC6
                                 0EC6                $DS_ABORT           TEST                     ; abort test
                      50    D4   0EC6                          CLRL      R0              ; SEND A WARNING TO THE SUPERVISOR
                      04    04   0EC8                          RET                       ; TERMINATE TEST
                                 0EC9      ;
                                 0EC9      ; Execute DATI, wait
                                 0EC9      ;
                66    65    B0   0EC9      50$:      MOVW      (R5),(R6)                      ; load pattern
             00001850'EF    16   0ECC                JSB       UBE_SET_UP                     ; execute DATI
                                 0ED2                $DS_WAITMS_S      TIME=#1              ; wait
                      00    DD   0ED2                          PUSHL     #0
                      01    DD   0ED4                          PUSHL     #1
       00010060 9F    02    FB   0ED6                          CALLS     #2, @#DS$WAITMS
                                 0EDD      ;
                                 0EDD      ; Check for data or execution errors, report if any
                                 0EDD      ;
0000004E'EF    00F26010 9F  D0   0EDD                MOVL      @#A_UBI_CSR,L_SAVE_CSR         ; save UBI CSR
         65    000002AF'FF  B1   0EE8                CMPW      @A_BEO_DB,(R5)                 ; check UBE data register
                      12    13   0EEF                BEQL      60$                            ; br = no data error
   00000000'EF    1000 8F   A8   0EF1                BISW2     #M_DATA_ERR,W_FLAGS            ; set data error flag
         52    000002AF'FF  3C   0EFA                MOVZWL    @A_BEO_DB,R2                   ; extend actual data
                      15    11   0F01                BRB       70$                            ; br to error report
0000004E'EF    8001C000 8F  D3   0F03      60$:      BITL      #M_UBI_STS,L_SAVE_CSR          ; check UBI status bits
                      08    12   0F0E                BNEQ      70$                            ; br = UBI error
     37 000002BF'FF   0F    E1   0F10                BBC       #V_ERR,@A_BEO_CR1,75$          ; br = no UBE errors
                                 0F18
                                 0F18      70$:      $DS_ERRHARD_S     UNIT=BEO_UNIT_NO,-     ; report data error
                                 0F18                                  MSGADR=T_AO_DATI_ERR,-
                                 0F18                                  PRLINK=XFER_ERR,-
                                 0F18                                  P1=A_BEO_DB,-          ; location
                                 0F18                                  P2=(R5),-              ; expected value
                                 0F18                                  P3=R2,-                ; actual value
                                 0F18                                  P4=#T_WORD_ERR,-       ; data type
                                 0F18                                  P5=FRST_VAL_MAP        ; map number used
             00000002'EF    DD   0F18                          PUSHL     FRST_VAL_MAP
             00000DA0'8F    DD   0F1E                          PUSHL     #T_WORD_ERR
                      52    DD   0F24                          PUSHL     R2
                      65    DD   0F26                          PUSHL     (R5)
             000002AF'EF    DD   0F28                          PUSHL     A_BEO_DB
             00001420'EF    DF   0F2E                          PUSHAL    XFER_ERR
             000006B3'EF    DF   0F34                          PUSHAL    T_AO_DATI_ERR
             00000000'EF    DD   0F3A                          PUSHL     BEO_UNIT_NO
                      02    DD   0F40                          PUSHL     #$ER
                                 0F42           ;;; TEST 8, SUBTEST 13, ERROR 2
       000100D0 9F    09    FB   0F42                          CALLS     #$$M, @#DS$ERRHARD
                                 0F49
             00000000'EF    B4   0F49                CLRW      W_FLAGS                        ; clear flags word
                                 0F4F      75$:      $DS_CKLOOP        30$                    ; scope loop at 30$
    0001004C 9F    FF2F CF  FA   0F4F                          CALLG     30$, @#DS$CKLOOP
                                 0F58      ;
```

```
                                      0F58  2839 ; Adjust pointer and end subtest if patterns exhausted and both longword- and
                                      0F58  2840 ; word-aligned cases have been tested.
                                      0F58  2841 ;
                 00FF 8F     85   B1  0F58  2842 80$:    CMPW    (R5)+,#^X00FF                      ; patterns exhausted ?
                             03   13  0F5D  2843         BEQL    90$                                ; br = patterns exhausted
                           FF20   31  0F5F  2844         BRW     30$                                ; br = patterns not exhausted
                   03 56     01   E2  0F62  2845 90$:    BBSS    #1,R6,100$                         ; br = done for word alignment
                           FF12   31  0F66  2846         BRW     10$                                ; br, repeat for word alignment
                                      0F69  2847 100$:
                                      0F69  2848         $DS_ENDSUB
                                      0F69       T8_S13_X:
    00010038 9F     00000090'EF   FA  0F69                       CALLG   $S$, @#DS$ENDSUB
                                      0F74  2849
                                      0F74  2850         $DS_PAGE
```

```
                                    0F74          .SBTTL  SUBTEST 8.14:  Address Offset DATO
                                    0F74  2853 ;+
                                    0F74  2854 ; Subtest description:
                                    0F74  2855 ;
                                    0F74  2856 ;         This subtest checks the ability of the UBI to  perform a
                                    0F74  2857 ;         DATO transaction in address offset mode.
                                    0F74  2858 ;
                                    0F74  2859 ; Subtest steps:
                                    0F74  2860 ;
                                    0F74  2861 ;         SUBTEST Address Offset DATO
                                    0F74  2862 ;         :  Invalidate all maps but one
                                    0F74  2863 ;         :  DO FOR Alignment = {word, longword}
                                    0F74  2864 ;         :  :  REPEAT
                                    0F74  2865 ;         :  :  :  Initiate DATO
                                    0F74  2866 ;         :  :  :  WAIT
                                    0F74  2867 ;         :  :  :  IF Execution error
                                    0F74  2868 ;         :  :  :  :  THEN REPORT error
                                    0F74  2869 ;         :  :  :  ENDIF
                                    0F74  2870 ;         :  :  :  IF Data error
                                    0F74  2871 ;         :  :  :  :  THEN REPORT error
                                    0F74  2872 ;         :  :  :  ENDIF
                                    0F74  2873 ;         :  :  : UNTIL patterns exhausted
                                    0F74  2874 ;         :  :  ENDREPEAT
                                    0F74  2875 ;         :  ENDDO
                                    0F74  2876 ;         ENDSUBTEST Address Offset DATO
                                    0F74  2877 ;
                                    0F74  2878 ; Errors:
                                    0F74  2879 ;
                                    0F74  2880 ;-
                                    0F74  2881          $DS_BGNSUB
                                    0F74       T8_S14::
  00010030 9F   0000009C'EF     FA  0F74                       CALLG   $S$, @#DS$BGNSUB
                                    0F7F  2882
                   37    00     DA  0F7F  2883          MTPR    #0,#PR$L_UB_INIT                ; initialize Unibus devices
              00000000'EF       B4  0F82  2884          CLRW    W_FLAGS                         ; clear flags word
        56    00000000'EF  01   C1  0F88  2885          ADDL3   #T,A_UBE_BUFFER_0,R6            ; load memory loc address
              55    0000029F'EF 3E  0F90  2886 0$:      MOVAW   W_PTRN_TBL,R5                   ; load pattern table address
                                    0F97  2887 ;
                                    0F97  2888 ; Load address and data into DATO command table
                                    0F97  2889 ;
              0000005E'EF  65   B0  0F97  2890 10$:     MOVW    (R5),L_EXP_DATA                 ; load pattern
              59    000002EF'EF 3E  0F9E  2891          MOVAW   UBE_DATO_1,R9                   ; load command table address
          02 A9    0000005E'EF  B0  0FA5  2892          MOVW    L_EXP_DATA,2(R9)                ; load data
              06 A9    56  01   A3  0FAD  2893          SUBW3   #T,R6,6(R9)                     ; load offset within page
06 A9    09    09  00000002'EF  F0  0FB2  2894          INSV    FRST_VAL_MAP,#9,#9,6(R9)        ; load Map Number
                           66   B4  0FBC  2895          CLRW    (R6)                            ; clear buffer location
                                    0FBE  2896 ;
                                    0FBE  2897 ; If ready bit not set then report error and abort test
                                    0FBE  2898 ;
      29 000002BF'FF       07   E0  0FBE  2899 20$:     BBS     #V_RDY,@A_BEO_CR1,30$           ; br = ready bit set
                                    0FC6  2900
  0000004E'EF   00F26010 9F     D0  0FC6  2901          MOVL    @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
                                    0FD1  2902          $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-      ; report no-RDY error
                                    0FD1  2903                          MSGADR=T_AO_DATO_ERR,-
                                    0FD1  2904                          PRLINK=XFER_ERR
              00001420'EF       DF  0FD1                       PUSHAL  XFER_ERR
              00000640'EF       DF  0FD7                       PUSHAL  T_AO_DATO_ERR
```

```
            00000000'EF    DD  0FDD                          PUSHL    BEO_UNIT_NO
                     01    DD  0FE3                          PUSHL    #$ER
                               0FE5       ;;; TEST 8, SUBTEST 14, ERROR 1
       000100D0 9F   04    FB  0FE5                          CALLS    #$$M, @#DS$ERRHARD
                               0FEC  2905
                               0FEC  2906           $DS_ABORT          TEST                    ; abort test
                     50    D4  0FEC                          CLRL     R0                ; SEND A WARNING TO THE SUPERVISOR
                     04        0FEE                          RET                        ; TERMINATE TEST
                               0FEF  2907 ;
                               0FEF  2908 ; Execute DATO, wait
                               0FEF  2909 ;
            00001850'EF    16  0FEF  2910 30$:      JSB      UBE_SET_UP                     ; execute DATO
                               0FF5  2911           $DS_WAITMS_S    TIME=#1                 ; wait
                     00    DD  0FF5                          PUSHL    #0
                     01    DD  0FF7                          PUSHL    #1
       00010060 9F   02    FB  0FF9                          CALLS    #2, @#DS$WAITMS
                               1000  2912 ;
                               1000  2913 ; Check for data or execution errors, report if any
                               1000  2914 ;
 0000004E'EF    00F26010 9F    D0  1000  2915           MOVL     @#A_UBI_CSR,L_SAVE_CSR         ; save UBI CSR
          66    0000005E'EF    B1  100B  2916           CMPW     L_EXP_DATA,(R6)                ; check UBE data register
                         0B    13  1012  2917           BEQL     40$                            ; br = ok
    00000000'EF       1000 8F    A8  1014  2918           BISW2    #M_DATA_ERR,W_FLAGS            ; set data error flag
                         15    11  101D  2919           BRB      50$                            ; br to error report
 0000004E'EF    8001C000 8F    D3  101F  2920 40$:      BITL     #M_UBI_STS,L_SAVE_CSR          ; check UBI status bits
                         08    12  102A  2921           BNEQ     50$                            ; br = UBI error
       37 000002BF'FF    0F    E1  102C  2922           BBC      #V_ERR,@A_BEO_CR1,55$          ; br = no UBE errors
                               1034  2923
                               1034  2924 50$:      $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-      ; report data error
                               1034  2925                            MSGADR=T_AO_DATO_ERR,-
                               1034  2926                            PRLINK=XFER_ERR,-
                               1034  2927                            P1=R6,-                 ; location
                               1034  2928                            P2=L_EXP_DATA,-         ; expected value
                               1034  2929                            P3=(R6),-               ; actual value
                               1034  2930                            P4=#T_WORD_ERR,-        ; data type
                               1034  2931                            P5=FRST_VAL_MAP         ; map number used
            00000002'EF    DD  1034                          PUSHL    FRST_VAL_MAP
            00000DA0'8F    DD  103A                          PUSHL    #T_WORD_ERR
                     66    DD  1040                          PUSHL    (R6)
            0000005E'EF    DD  1042                          PUSHL    L_EXP_DATA
                     56    DD  1048                          PUSHL    R6
            00001420'EF    DF  104A                          PUSHAL   XFER_ERR
            00000640'EF    DF  1050                          PUSHAL   T_AO_DATO_ERR
            00000000'EF    DD  1056                          PUSHL    BEO_UNIT_NO
                     02    DD  105C                          PUSHL    #$ER
                               105E       ;;; TEST 8, SUBTEST 14, ERROR 2
       000100D0 9F   09    FB  105E                          CALLS    #$$M, @#DS$ERRHARD
                               1065  2932
            00000000'EF    B4  1065  2933           CLRW     W_FLAGS                        ; clear flags word
                               106B  2934 55$:      $DS_CKLOOP       10$                    ; scope loop at 10$
    00010040 9F    FF28 CF    FA  106B                          CALLG    10$, @#DS$CKLOOP
                               1074  2935 ;
                               1074  2936 ; Adjust pointer and end subtest if patterns exhausted and both longword- and
                               1074  2937 ; word-aligned cases have been tested.
                               1074  2938 ;
          00FF 8F    85    B1  1074  2939 60$:      CMPW     (R5)+,#^X00FF                  ; patterns exhausted?
                     03    13  1079  2940           BEQL     90$                            ; br = patterns exhausted
                     FF19   31  107B  2941          BRW     10$                      ; br = patterns not exhausted
              03 56    01   E2  107E  2942 90$:     BBSS    #1,R6,100$               ; br = done for word alignment
                     FF0B   31  1082  2943          BRW     0$                       ; br, repeat for word alignment
                                1085  2944 100$:
                                1085  2945
                                1085  2946          $DS_ENDSUB
                                1085           T8_S14_X:
     00010038 9F    0000009C'EF  FA  1085                         CALLG   $S$, @#DS$ENDSUB
                                1090  2947
                                1090  2948          $DS_PAGE
```

```
                                           1090          .SBTTL  SUBTEST 8.15:  Address Offset DATOB
                                           1090  2951 ;+
                                           1090  2952 ; Subtest description:
                                           1090  2953 ;
                                           1090  2954 ;         This subtest checks the ability of the UBI to  perform a DATOB
                                           1090  2955 ;         transaction in address offset mode.
                                           1090  2956 ;
                                           1090  2957 ; Subtest steps:
                                           1090  2958 ;
                                           1090  2959 ;         SUBTEST Address Offset DATOB
                                           1090  2960 ;         :  Invalidate all maps but one
                                           1090  2961 ;         :  DO FOR Alignment = {word, longword}
                                           1090  2962 ;         :  :  REPEAT
                                           1090  2963 ;         :  :  :  Initiate DATOB
                                           1090  2964 ;         :  :  :  WAIT
                                           1090  2965 ;         :  :  :  If Execution error
                                           1090  2966 ;         :  :  :  :  THEN REPORT error
                                           1090  2967 ;         :  :  :  ENDIF
                                           1090  2968 ;         :  :  :  If Data error
                                           1090  2969 ;         :  :  :  :  THEN REPORT error
                                           1090  2970 ;         :  :  :  ENDIF
                                           1090  2971 ;         :  :  : UNTIL patterns exhausted
                                           1090  2972 ;         :  :  ENDREPEAT
                                           1090  2973 ;         :  ENDDO
                                           1090  2974 ;         ENDSUBTEST Address Offset DATOB
                                           1090  2975 ;
                                           1090  2976 ; Errors:
                                           1090  2977 ;
                                           1090  2978 ;-
                                           1090  2979          $DS_BGNSUB
                                           1090        T8_S15::
        00010030 9F    000000A8'EF    FA   1090                  CALLG   $S$, @#DS$BGNSUB
                                           109B  2980
                        37     00     DA   109B  2981          MTPR    #0,#PR$L_UB_INIT                  ; initialize Unibus devices
                     00000000'EF      B4   109E  2982          CLRW    W_FLAGS                           ; clear flags word
                     00000000'FF      D4   10A4  2983          CLRL    @A_UBE_BUFFER_0                   ; clear buffer longword
             56    00000000'EF    01  C1   10AA  2984          ADDL3   #1,A_UBE_BUFFER_0,R6              ; load memory loc address
             55    0000029F'EF        3E   10B2  2985 0$:      MOVAW   W_PTRN_TBL,R5                     ; load pattern table address
                                           10B9  2986 ;
                                           10B9  2987 ; Load address and data into DATOB command table
                                           10B9  2988 ;
                               66     B4   10B9  2989 10$:     CLRW    (R6)                              ; clear destination
                     0000005E'EF   65 B0   10BB  2990          MOVW    (R5),L_EXP_DATA                   ; load expected pattern
                  59    000002E3'EF   3E   10C2  2991          MOVAW   UBE_DATOB_T,R9                    ; load command table address
               02 A9    0000005E'EF   90   10C9  2992          MOVB    L_EXP_DATA,2(R9)                  ; load data
                    06 A9    56    01 A3   10D1  2993          SUBW3   #1,R6,6(R9)                       ; load offset within page
  06 A9    09    09    00000002'EF    F0   10D6  2994          INSV    FRST_VAL_MAP,#9,#9,6(R9)          ; load Map Number
                                           10E0  2995 ;
                                           10E0  2996 ; If ready bit not set then report error and abort test
                                           10E0  2997 ;
             29 000002BF'FF    07     E0   10E0  2998 20$:     BBS     #V_RDY,@A_BEO_CR1,30$             ; br = ready bit set
                                           10E8  2999
        0000004E'EF    00F26010 9F    D0   10E8  3000          MOVL    @#A_UBI_CSR,L_SAVE_CSR            ; save UBI CSR
                                           10F3  3001          $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-        ; report no-RDY error
                                           10F3  3002                          MSGADR=T_AO_DATOB_ERR,-
                                           10F3  3003                          PRLINK=XFER_ERR
                     00001420'EF      DF   10F3                  PUSHAL  XFER_ERR
```

```
            00000679'EF   DF  10F9                         PUSHAL  T_AO_DATOB_ERR
            00000000'EF   DD  10FF                         PUSHL   BEO_UNIT_NO
                     01   DD  1105                         PUSHL   #$ER
                              1107      ;;; TEST 8, SUBTEST 15, ERROR 1
        000100D0 9F  04   FB  1107                         CALLS   #$$M, @#DS$ERRHARD
                              110E  3004
                              110E  3005          $DS_ABORT        TEST                         ; abort test
                     50   D4  110E                         CLRL    R0                      ; SEND A WARNING TO THE SUPERVISOR
                     04       1110                         RET                             ; TERMINATE TEST
                              1111  3006 ;
                              1111  3007 ; Execute DA!OB, wait
                              1111  3008 ;
            00001850'EF   16  1111  3009 30$:     JSB      UBE_SET_UP                         ; execute DATOB
                              1117  3010          $DS_WAITMS_S     TIME=#1                    ; wait
                     00   DD  1117                         PUSHL   #0
                     01   DD  1119                         PUSHL   #1
        00010060 9F  02   FB  111B                         CALLS   #2, @#DS$WAITMS
                              1122  3011 ;
                              1122  3012 ; Check for data or execution errors, report if any
                              1122  3013 ;
  0000004E'EF   00F26010 9F   D0  1122  3014          MOVL     @#A_UBI_CSR,L_SAVE_CSR             ; save UBI CSR
          66   0000005E'EF   91  112D  3015          CMPB     L_EXP_DATA,(R6)                    ; check UBE data register
                          0B  13  1134  3016          BEQL     40$                                ; br = ok
     00000000'EF     1000 8F  A8  1136  3017          BISW2    #M_DATA_ERR,W_FLAGS                ; set data error flag
                          15  11  113F  3018          BRB      50$                                ; br to error report
  0000004E'EF   8001C000 8F   D3  1141  3019 40$:     BITL     #M_UBI_STS,L_SAVE_CSR              ; check UBI status bits
                          08  12  114C  3020          BNEQ     50$                                ; br = UBI error
        37 000002BF'FF    0F  E1  114E  3021          BBC      #V_ERR,@A_BEO_CR1,55$              ; br = no UBE errors
                              1156  3022
                              1156  3023 50$:     $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-         ; report data error
                              1156  3024                           MSGADR=T_AO_DATOB_ERR,-
                              1156  3025                           PRLINK=XFER_ERR,-
                              1156  3026                           P1=R6,-                    ; location
                              1156  3027                           P2=L_EXP_DATA,-            ; expected value
                              1156  3028                           P3=(R6),-                  ; actual value
                              1156  3029                           P4=#T_BYTE_ERR,-           ; data type
                              1156  3030                           P5=FRST_VAL_MAP            ; map number used
            00000002'EF   DD  1156                         PUSHL   FRST_VAL_MAP
            00000D72'8F   DD  115C                         PUSHL   #T_BYTE_ERR
                     66   DD  1162                         PUSHL   (R6)
            0000005E'EF   DD  1164                         PUSHL   L_EXP_DATA
                     56   DD  116A                         PUSHL   R6
            00001420'EF   DF  116C                         PUSHAL  XFER_ERR
            00000679'EF   DF  1172                         PUSHAL  T_AO_DATOB_ERR
            00000000'EF   DD  1178                         PUSHL   BEO_UNIT_NO
                     02   DD  117E                         PUSHL   #$ER
                              1180      ;;; TEST 8, SUBTEST 15, ERROR 2
        000100D0 9F  09   FB  1180                         CALLS   #$$M, @#DS$ERRHARD
                              1187  3031
            00000000'EF   B4  1187  3032          CLRW     W_FLAGS                            ; clear flags word
                              118D  3033 55$:     $DS_CKLOOP       10$                        ; scope loop at 10$
     00010040 9F    FF28 CF   FA  118D                         CALLG   10$, @#DS$CKLOOP
                              1196  3034 ;
                              1196  3035 ; Adjust pointer and end subtest if patterns exhausted and both longword- and
                              1196  3036 ; word-aligned cases have been tested.
                              1196  3037 ;
         0F0F 8F     85   B1  1196  3038 60$:     CMPW     (R5)+,#^X0F0F                      ; patterns exhausted?
```

```
                        03    13  119B  3039           BEQL    90$                                   ; br = patterns exhausted
                      FF19    31  119D  3040           BRW     10$                                   ; br = patterns not exhausted
                 03 56  01    E2  11A0  3041 90$:      BBSS    #1,R6,100$                            ; br = done for word alignment
                      FF0B    31  11A4  3042           BRW     0$                                    ; br, repeat for word alignment
                                  11A7  3043 100$:
                                  11A7  3044
                                  11A7  3045           $DS_ENDSUB
                                  11A7           T8_S15_X:
     00010038 9F   000000A8'EF    FA  11A7                          CALLG    $S$, @#DS$ENDSUB
                                  11B2  3046
                                  11B2  3047           $DS_PAGE
                                  11B2           .SBTTL  SUBTEST 8.16:  Address Offset DATIP/DATO
                                  11B2  3050 ;+
                                  11B2  3051 ; Subtest description:
                                  11B2  3052 ;
                                  11B2  3053 ;        This subtest checks the ability of the UBI to  perform a
                                  11B2  3054 ;        DATIP/DATO transaction in address offset mode.
                                  11B2  3055 ;
                                  11B2  3056 ; Subtest steps:
                                  11B2  3057 ;
                                  11B2  3058 ;        SUBTEST Address Offset DATIP/DATO
                                  11B2  3059 ;        :  Invalidate all maps but one
                                  11B2  3060 ;        :  DO FOR Alignment = {word, longword}
                                  11B2  3061 ;        :  :  REPEAT
                                  11B2  3062 ;        :  :  :  Initiate DATIP/DATO
                                  11B2  3063 ;        :  :  :  WAIT
                                  11B2  3064 ;        :  :  :  IF Execution error
                                  11B2  3065 ;        :  :  :  :  THEN REPORT error
                                  11B2  3066 ;        :  :  :  ENDIF
                                  11B2  3067 ;        :  :  :  IF Data error
                                  11B2  3068 ;        :  :  :  :  THEN REPORT error
                                  11B2  3069 ;        :  :  :  ENDIF
                                  11B2  3070 ;        :  :  : UNTIL patterns exhausted
                                  11B2  3071 ;        :  :  ENDREPEAT
                                  11B2  3072 ;        :  ENDDO
                                  11B2  3073 ;        ENDSUBTEST Address Offset DATIP/DATO
                                  11B2  3074 ;
                                  11B2  3075 ; Errors:
                                  11B2  3076 ;
                                  11B2  3077 ;-
                                  11B2  3078         $DS_BGNSUB
                                  11B2       T8_S16::
 00010030 9F   000000B4'EF   FA   11B2                     CALLG   $S$, @#DS$BGNSUB
                                  11BD  3079
                  37   00    DA   11BD  3080         MTPR    #0,#PR$L_UB_INIT                ; initialize Unibus devices
               00000000'EF   B4   11C0  3081         CLRW    W_FLAGS                         ; clear flags word
               00000000'FF   7C   11C6  3082         CLRQ    @A_UBE_BUFFER_0                 ; clear buffer quadword
       56  00000000'EF   01  C1   11CC  3083         ADDL3   #1,A_UBE_BUFFER_0,R6            ; load memory loc address
       55  0000029F'EF       3E   11D4  3084 0$:     MOVAW   W_PTRN_TBL,R5                   ; load pattern table address
                                  11DB  3085 ;
                                  11DB  3086 ; Set up DATIP/DATO from/to main memory location and load expected value
                                  11DB  3087 ;
                  66   65    B0   11DB  3088 10$:    MOVW    (R5),(R6)                       ; load pattern
     0000005E'EF  66   01    9C   11DE  3089         ROTL    #1,(R6),L_EXP_DATA              ; load expected data into R4
  51 0000005E'EF  01   10    EF   11E6  3090         EXTZV   #16,#1,L_EXP_DATA,R1            ; extract end-around carry bit
        0000005E'EF    51    C8   11EF  3091         BISL2   R1,L_EXP_DATA                   ; insert carry bit
          59   000002D7'EF   3E   11F6  3092         MOVAW   UBE_DATIP_1,R9                  ; load command table address
           06 A9   56   01   A3   11FD  3093         SUBW3   #1,R6,6(R9)                     ; load offset within page
 06 A9   09   09   00000002'EF F0 1202  3094         INSV    FRST_VAL_MAP,#9,#9,6(R9)        ; load Map Number
                                  120C  3095 ;
                                  120C  3096 ; If ready bit not set then report error and abort test
                                  120C  3097 ;
       29 000002BF'FF   07   E0   120C  3098 20$:    BBS     #V_RDY,@A_BEO_CR1,30$           ; br = ready bit set
                                  1214  3099
   0000004E'EF   00F26010 9F DO   1214  3100         MOVL    @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
                                  121F  3101         $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-      ; report no-RDY error
                                  121F  3102                         MSGADR=T_AO_DATIP_ERR,-
                                  121F  3103                         PRLINK=XFER_ERR
```

```
                00001420'EF   DF  121F                       PUSHAL  XFER_ERR
                000006EC'EF   DF  1225                       PUSHAL  T_AO_DATIP_ERR
                00000000'EF   DD  122B                       PUSHL   BEO_UNIT_NO
                         01   DD  1231                       PUSHL   #$ER
                                  1233          ;;; TEST 8, SUBTEST 16, ERROR 1
            000100D0 9F   04  FB  1233                       CALLS   #$$M, @#DS$ERRHARD
                                  123A  3104
                                  123A  3105         $DS_ABORT       TEST                        ; abort test
                         50   D4  123A                       CLRL    R0                  ; SEND A WARNING TO THE SUPERVISOR
                              04  123C                       RET                         ; TERMINATE TEST
                                  123D  3106 ;
                                  123D  3107 ; Execute DATIP/DATO, wait
                                  123D  3108 ;
                00001850'EF   16  123D  3109 30$:    JSB     UBE_SET_UP                          ; execute DATIP/DATO
                                  1243  3110         $DS_WAITMS_S    TIME=#1                     ; wait
                         00   DD  1243                       PUSHL   #0
                         01   DD  1245                       PUSHL   #1
            00010060 9F   02  FB  1247                       CALLS   #2, @#DS$WAITMS
                                  124E  3111 ;
                                  124E  3112 ; Check for DATIP data or execution errors, report if any
                                  124E  3113 ;
 0000004E'EF      00F26010 9F  D0  124E  3114         MOVL    @#A_UBI_CSR,L_SAVE_CSR              ; save UBI CSR
 000002AF'FF     0000005E'EF   B1  1259  3115         CMPW    L_EXP_DATA,@A_BEO_DB                ; check UBE data register
                         12   13  1264  3116         BEQL    40$                                 ; br = ok
     00000000'EF      1000 8F  A8  1266  3117         BISW2   #M_DATA_ERR,W_FLAGS                 ; set data error flag
           52     000002AF'FF  3C  126F  3118         MOVZWL  @A_BEO_DB,R2                        ; load actual data
                         15   11  1276  3119         BRB     50$                                 ; br to error report
 0000004E'EF      8001C000 8F  D3  1278  3120 40$:    BITL    #M_UBI_STS,L_SAVE_CSR               ; check UBI status bits
                         08   12  1283  3121         BNEQ    50$                                 ; br = UBI error
        3B 000002BF'FF    0F  E1  1285  3122         BBC     #V_ERR,@A_BEO_CR1,60$               ; br = no UBE errors
                                  128D  3123
                                  128D  3124 50$:    $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-          ; report data error
                                  128D  3125                         MSGADR=T_AO_DATIP_ERR,-
                                  128D  3126                         PRLINK=XFER_ERR,-
                                  128D  3127                         P1=A_BEO_DB,-               ; location
                                  128D  3128                         P2=L_EXP_DATA,-             ; expected value
                                  128D  3129                         P3=R2,-                     ; actual value
                                  128D  3130                         P4=#T_WORD_ERR,-            ; data type
                                  128D  3131                         P5=FRST_VAL_MAP             ; map number used
                00000002'EF   DD  128D                       PUSHL   FRST_VAL_MAP
                00000DA0'8F   DD  1293                       PUSHL   #T_WORD_ERR
                         52   DD  1299                       PUSHL   R2
                0000005E'EF   DD  129B                       PUSHL   L_EXP_DATA
                000002AF'EF   DD  12A1                       PUSHL   A_BEO_DB
                00001420'EF   DF  12A7                       PUSHAL  XFER_ERR
                000006EC'EF   DF  12AD                       PUSHAL  T_AO_DATIP_ERR
                00000000'EF   DD  12B3                       PUSHL   BEO_UNIT_NO
                         02   DD  12B9                       PUSHL   #$ER
                                  12BB          ;;; TEST 8, SUBTEST 16, ERROR 2
            000100D0 9F   09  FB  12BB                       CALLS   #$$M, @#DS$ERRHARD
                                  12C2  3132
                00000000'EF   B4  12C2  3133         CLRW    W_FLAGS                             ; clear flags word
                                  12C8  3134 ;
                                  12C8  3135 ; Check DATO data, if error then report
                                  12C8  3136 ;
           66     0000005E'EF  B1  12C8  3137 60$:    CMPW    L_EXP_DATA,(R6)                     ; check data returned
                         40   13  12CF  3138         BEQL    65$                                 ; br = ok
```

```
                                 12D1  3139
      00000000'EF     1000 8F   A8   12D1  3140            BISW2   #M_DATA_ERR,W_FLAGS          ; set data error flag
                                     12DA  3141            $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-   ; report data error
                                     12DA  3142                    MSGADR=T_AO_DATIP_ERR,-
                                     12DA  3143                    PRLINK=XFER_ERR,-
                                     12DA  3144                    P1=R6,-                      ; location
                                     12DA  3145                    P2=L_EXP_DATA,-              ; expected value
                                     12DA  3146                    P3=(R6),-                    ; actual value
                                     12DA  3147                    P4=#T_WORD_ERR,-             ; data type
                                     12DA  3148                    P5=FRST_VAL_MAP              ; map number used
             00000002'EF        DD   12DA                  PUSHL   FRST_VAL_MAP
             00000DA0'8F        DD   12E0                  PUSHL   #T_WORD_ERR
                      66        DD   12E6                  PUSHL   (R6)
             0000005E'EF        DD   12E8                  PUSHL   L_EXP_DATA
                      56        DD   12EE                  PUSHL   R6
             00001420'EF        DF   12F0                  PUSHAL  XFER_ERR
             000006EC'EF        DF   12F6                  PUSHAL  T_AO_DATIP_ERR
             00000000'EF        DD   12FC                  PUSHL   BEO_UNIT_NO
                      03        DD   1302                  PUSHL   #SER
                                     1304       ;;; TEST 8, SUBTEST 16, ERROR 3
         000100D0 9F      09    FB   1304                  CALLS   #$$M, @#DS$ERRHARD
                                     130B  3149
             00000000'EF        B4   130B  3150            CLRW    W_FLAGS                      ; clear flags word
                                     1311  3151 65$:       $DS_CKLOOP      10$                  ; scope loop at 10$
      00010040 9F    FEC6 CF    FA   1311                  CALLG   10$, @#DS$CKLOOP
                                     131A  3152 ;
                                     131A  3153 ; Adjust pointer and end subtest if patterns exhausted and both longword- and
                                     131A  3154 ; word-aligned cases have been tested.
                                     131A  3155 ;
             00FF 8F      85    B1   131A  3156 70$:       CMPW    (R5)+,#^X00FF               ; patterns exhausted?
                          03    13   131F  3157            BEQL    90$                          ; br = patterns exhausted
                        FEB7    31   1321  3158            BRW     10$                          ; br = patterns not exhausted
                 03 56    01    E2   1324  3159 90$:       BBSS    #1,R6,100$                   ; br = done for word alignment
                        FEA9    31   1328  3160            BRW     0$                           ; br, repeat for word alignment
                                     132B  3161 100$:
                                     132B  3162
                                     132B  3163            $DS_ENDSUB
                                     132B       T8_S16_X:
      00010038 9F    000000B4'EF    FA   132B                  CALLG   $S$, @#DS$ENDSUB
                                     1336  3164
                                     1336  3165            $DS_PAGE
```

```
                                        1336             .SBTTL  SUBTEST 8.17:  Map Function
                                        1336  3168 ;+
                                        1336  3169 ; Subtest description:
                                        1336  3170 ;
                                        1336  3171 ;         This subtest checks the ability of the UBI to correctly handle
                                        1336  3172 ;         transactions using all useable map registers. 512 map registers are
                                        1336  3173 ;         potentially useable, but of that set some may not be useable due to the
                                        1336  3174 ;         presence of Unibus Memory. Therefore, before the testing of the maps is
                                        1336  3175 ;         started, the Unibus is sized for memory to ascertain which of the maps
                                        1336  3176 ;         are useable. A bitvector is generated by the Unibus sizer routine. If a
                                        1336  3177 ;         map is useable, its bit in the bitvector is set. For each map that is
                                        1336  3178 ;         available for testing, a DATI with a unique pattern is set up, executed
                                        1336  3179 ;         and verified.
                                        1336  3180 ;
                                        1336  3181 ; Subtest steps:
                                        1336  3182 ;
                                        1336  3183 ;         SUBTEST MAP FUNCTION
                                        1336  3184 ;         :  Invalidate all Maps
                                        1336  3185 ;         :  REPEAT
                                        1336  3186 ;         :  :  IF Map Entry usable
                                        1336  3187 ;         :  :  :  THEN DO
                                        1336  3188 ;         :  :  :  :  VALIDATE Map Entry
                                        1336  3189 ;         :  :  :  :  CLEAR UBE Data register
                                        1336  3190 ;         :  :  :  :  EXECUTE DATI
                                        1336  3191 ;         :  :  :  :  WAIT
                                        1336  3192 ;         :  :  :  :  IF error
                                        1336  3193 ;         :  :  :  :  :  THEN REPORT error
                                        1336  3194 ;         :  :  :  :  ENDIF
                                        1336  3195 ;         :  :  :  :  INVALIDATE Map Entry
                                        1336  3196 ;         :  :  :  ENDDO
                                        1336  3197 ;         :  :  ENDIF
                                        1336  3198 ;         :  : UNTIL All Usable Map Entries exhausted
                                        1336  3199 ;         :  ENDREPEAT
                                        1336  3200 ;         ENDSUBTEST MAP FUNCTION
                                        1336  3201 ;
                                        1336  3202 ; Errors:
                                        1336  3203 ;
                                        1336  3204 ;-
                                        1336  3205           $DS_BGNSUB
                                        1336       T8_S17::
 00010030 9F    000000C0'EF      FA     1336                     CALLG   $S$, @#DS$BGNSUB
                                        1341  3206
             00000000'EF         B4     1341  3207           CLRW    W_FLAGS                     ; clear flags word
                   37   00       DA     1347  3208           MTPR    #0,#PR$L_UB_INIT            ; initialize Unibus devices
             000018FB'EF         16     134A  3209           JSB     INVAL_MAPS                  ; invalidate all Map Entries
         00000000'FF    01       D0     1350  3210           MOVL    #1,@A_UBE_BUFFER_0          ; load data into buffer
      00000000'EF   0F   09      EF     1357  3211           EXTZV   #9,#15,A_UBE_BUFFER_0,L_PAGE_NO  ; extract page frame number
             0000004A'EF                135F
                                        1364  3212 ;
                                        1364  3213 ; If map is usable then: load address into DATI command table,load Map Entry
                                        1364  3214 ; PFN, validate Map Entry
                                        1364  3215 ;
                         54      D4     1364  3216           CLRL    R4                          ; clear index
 00000000'FF    0000029F'EF      B0     1366  3217 10$:      MOVW    W_PTRN_TBL,@A_UBE_BUFFER_0  ; load data pattern
       03 00000006'EF    54      E0     1371  3218           BBS     R4,V_VALID_MAPS,20$         ; br = usable Map Entry
                       00EE      31     1379  3219           BRW     70$                         ; br = not usable Map Entry
        59    000002CB'EF        DE     137C  3220 20$:      MOVAL   UBE_DATI_1,R9               ; load command table address
```

```
          06 A9   00000000'EF   B0  1383         MOVW     A_UBE_BUFFER_0,6(R9)            ; load offset within page
          06 A9   09   09   54   F0  138B         INSV     R4,#9,#9,6(R9)                  ; load Map Number
  00F26800 9F44   0000004A'EF   D0  1391         MOVL     L_PAGE_NO,@#A_MAP_BGN[R4]       ; load Map Entry PFN
  00F26800 9F44   80000000 8F   C8  139D         BISL2    #M_MAP_VAL,@#A_MAP_BGN[R4]      ; set Map Entry Valid bit
                                    13A9  ;
                                    13A9  ; If ready bit not set then report error and abort test
                                    13A9  ;
        29 000002BF'FF    07    E0  13A9  30$:   BBS      #V_RDY,@A_BEO_CR1,40$           ; br = ready bit set
                                    13B1
  0000004E'EF     00F26010 9F   D0  13B1         MOVL     @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
                                    13BC         $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-      ; report no-RDY error
                                    13BC                          MSGADR=T_MAP_FCN_ERR,-
                                    13BC                          PRLINK=XFER_ERR
                  00001420'EF   DF  13BC                 PUSHAL   XFER_ERR
                  0000075A'EF   DF  13C2                 PUSHAL   T_MAP_FCN_ERR
                  00000000'EF   DD  13C8                 PUSHL    BEO_UNIT_NO
                           01   DD  13CE                 PUSHL    #$ER
                                    13D0  ;;; TEST 8, SUBTEST 17, ERROR 1
        000100D0 9F       04    FB  13D0                 CALLS    #$$M, @#DS$ERRHARD
                                    13D7
                                    13D7         $DS_ABORT        TEST                    ; abort test
                           50   D4  13D7                 CLRL     R0              ; SEND A WARNING TO THE SUPERVISOR
                           04       13D9                 RET                      ; TERMINATE TEST
                                    13DA  ;
                                    13DA  ; Initiate DATI transaction, wait
                                    13DA  ;
                  00001850'EF   16  13DA  40$:   JSB      UBE_SET_UP                      ; execute DATI
                                    13E0         $DS_WAITMS_S     TIME=#1                 ; wait
                           00   DD  13E0                 PUSHL    #0
                           01   DD  13E2                 PUSHL    #1
        00010060 9F       02    FB  13E4                 CALLS    #2, @#DS$WAITMS
                                    13EB  ;
                                    13EB  ; Check for execution or data errors, report if any
                                    13EB  ;
  0000004E'EF     00F26010 9F   D0  13EB         MOVL     @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
  0000029F'EF     000002AF'FF   B1  13F6         CMPW     @A_BEO_DB,W_PTRN_TBL            ; check UBE Data register
                           12   13  1401         BEQL     50$                             ; br = no data error
      00000000'EF      1000 8F  A8  1403         BISW2    #M_DATA_ERR,W_FLAGS             ; set data error flag
           52     000002AF'FF   3C  140C         MOVZWL   @A_BEO_DB,R2                    ; extend actual data
                           15   11  1413         BRB      60$                             ; br to error report
  0000004E'EF     8001C000 8F   D3  1415  50$:   BITL     #M_UBI_STS,L_SAVE_CSR           ; check UBI status
                           08   12  1420         BNEQ     60$                             ; br = UBI error
        37 000002BF'FF    0F    E1  1422         BBC      #V_ERR,@A_BEO_CR1,65$           ; br = no UBE error
                                    142A
                                    142A  60$:   $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-      ; report data error
                                    142A                          MSGADR=T_MAP_FCN_ERR,-
                                    142A                          PRLINK=XFER_ERR,-
                                    142A                          P1=A_BEO_DB,-           ; location
                                    142A                          P2=W_PTRN_TBL,-         ; expected value
                                    142A                          P3=R2,-                 ; actual value
                                    142A                          P4=#T_WORD_ERR,-        ; data type
                                    142A                          P5=R4                   ; map number used
                           54   DD  142A                 PUSHL    R4
                  00000DA0'8F   DD  142C                 PUSHL    #T_WORD_ERR
                           52   DD  1432                 PUSHL    R2
                  0000029F'EF   DD  1434                 PUSHL    W_PTRN_TBL
                  000002AF'EF   DD  143A                 PUSHL    A_BEO_DB
```

```
                 00001420'EF     DF  1440                          PUSHAL  XFER_ERR
                 0000075A'EF     DF  1446                          PUSHAL  T_MAP_FCN_ERR
                 00000000'EF     DD  144C                          PUSHL   BEO_UNIT_NO
                          02     DD  1452                          PUSHL   #$ER
                                     1454            ;;; TEST 8, SUBTEST 17, ERROR 2
         000100D0 9F      09     FB  1454                          CALLS   #$$M, @#DS$ERRHARD
                                     145B  3262
                 00000000'EF     B4  145B  3263            CLRW    W_FLAGS                        ; clear flags word
                                     1461  3264 65$:       $DS_CKLOOP      10$                    ; scope loop at 10$
   00010040 9F     FF01 CF       FA  1461                          CALLG   10$, @#DS$CKLOOP
                                     146A  3265
            00F26800 9F44        D4  146A  3266 70$:       CLRL    @#A_MAP_BGN[R4]                ; invalidate Map Entry
                          54     D6  1471  3267            INCL    R4                             ; increment into index
         00000200 8F      54     D1  1473  3268 90$:       CMPL    R4,#512                        ; done ?
                          03     13  147A  3269            BEQL    100$                     -     ; br = done
                        FEE7     31  147C  3270            BRW     10$                            ; br = not done
                                     147F  3271 100$:
                                     147F  3272            $DS_ENDSUB
                                     147F       T8_S17_X:
  00010038 9F    000000C0'EF     FA  147F                          CALLG   $S$, @#DS$ENDSUB
                                     148A  3273
                                     148A  3274            $DS_PAGE
```

```
                                  148A               .SBTTL  SUBTEST 8.18:  Address Offset Map Function
                                  148A       ;+
                                  148A       ; Subtest description:
                                  148A       ;
                                  148A       ;       This subtest checks the ability of the UBI to correctly handle byte-off-
                                  148A       ;       set transactions using all useable map registers. 512 map registers are
                                  148A       ;       potentially useable, but of that set some may not be useable due to the
                                  148A       ;       presence of Unibus Memory. Therefore, before the testing of the maps is
                                  148A       ;       started, the Unibus is sized for memory to ascertain which of the maps
                                  148A       ;       are useable. A bitvector is generated by the Unibus sizer routine. If a
                                  148A       ;       map is useable, its bit in the bitvector is set. For each map that is
                                  148A       ;       available for testing, a DATI with a unique pattern is set up, executed
                                  148A       ;       and verified.
                                  148A       ;
                                  148A       ; Subtest steps:
                                  148A       ;
                                  148A       ;       SUBTEST ADDRESS OFFSET MAP FUNCTION
                                  148A       ;       :  Invalidate all Maps
                                  148A       ;       :  REPEAT
                                  148A       ;       :  :  IF Map Entry usable
                                  148A       ;       :  :  :  THEN DO
                                  148A       ;       :  :  :  :  VALIDATE Map Entry
                                  148A       ;       :  :  :  :  Set up Map Entry in Byte-offset mode
                                  148A       ;       :  :  :  :  CLEAR UBE Data register
                                  148A       ;       :  :  :  :  EXECUTE DATI
                                  148A       ;       :  :  :  :  WAIT
                                  148A       ;       :  :  :  :  IF error
                                  148A       ;       :  :  :  :  :  THEN REPORT error
                                  148A       ;       :  :  :  :  ENDIF
                                  148A       ;       :  :  :  :  INVALIDATE Map Entry
                                  148A       ;       :  :  :  ENDDO
                                  148A       ;       :  :  ENDIF
                                  148A       ;       : : UNTIL All Usable Map Entries exhausted
                                  148A       ;       :  ENDREPEAT
                                  148A       ;       ENDSUBTEST ADDRESS OFFSET MAP FUNCTION
                                  148A       ;
                                  148A       ; Errors:
                                  148A       ;
                                  148A       ;-
                                  148A               $DS_BGNSUB
                                  148A       T8_S18::
00010030 9F     000000CC'EF    FA 148A                        CALLG   $S$, @#DS$BGNSUB
                                  1495
                000000000'EF   B4 1495               CLRW    W_FLAGS                          ; clear flags word
                      37   00  DA 149B               MTPR    #0,#PR$L_UB_INIT                 ; initialize Unibus devices
                000018FB'EF    16 149E               JSB     INVAL_MAPS                       ; invalidate all Map Entries
     00000000'EF   0F    09    EF 14A4               EXTZV   #9,#15,A_UBE_BUFFER_0,L_PAGE_NO  ; extract page frame number
                0000004A'EF       14AC
     56   00000000'EF    01    C1 14B1               ADDL3   #1,A_UBE_BUFFER_0,R6             ; load address
                                  14B9       ;
                                  14B9       ; If map is usable then: load address into DATI command table,load Map Entry
                                  14B9       ; PFN, validate Map Entry in Byte-offset mode
                                  14B9       ;
                           54  D4 14B9               CLRL    R4                               ; clear index
          66   0000029F'EF     D0 14BB       10$:    MOVL    W_PTRN_TBL,(R6)                  ; load data into buffer
      03 00000006'EF     54    E0 14C2               BBS     R4,V_VALID_MAPS,20$              ; br = usable Map Entry
                         00EE  31 14CA               BRW     70$                              ; br = not usable Map Entry
          59    000002CB'EF    DE  14CD  3330 20$:     MOVAL    UBE_DATI_1,R9                     ; load command table address
       06 A9    00000000'EF    B0  14D4  3331          MOVW     A_UBE_BUFFER_0,6(R9)              ; load offset within page
       06 A9   09    09    54  F0  14DC  3332          INSV     R4,#9,#9,6(R9)                    ; load Map Number
  00F26800 9F44    0000004A'EF D0  14E2  3333          MOVL     L_PAGE_NO,@#A_MAP_BGN[R4]         ; load Map Entry PFN
  00F26800 9F44    82000000 8F C8  14EE  3334          BISL2    #<M_MAP_VAL!M_BYTE_OFF>,@#A_MAP_BGN[R4] ; set Map Valid & Offset
                                   14FA  3335 ;
                                   14FA  3336 ; If ready bit not set then report error and abort test
                                   14FA  3337 ;
        29 000002BF'FF      07 E0  14FA  3338 30$:     BBS      #V_RDY,@A_BEO_CR1,40$             ; br = ready bit set
                                   1502  3339
   0000004E'EF    00F26010 9F  D0  1502  3340          MOVL     @#A_UBI_CSR,L_SAVE_CSR            ; save UBI CSR
                                   150D  3341          $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-        ; report no-RDY error
                                   150D  3342                           MSGADR=T_MAP_FCN_ERR,-
                                   150D  3343                           PRLINK=XFER_ERR
                  00001420'EF  DF  150D                    PUSHAL   XFER_ERR
                  0000075A'EF  DF  1513                    PUSHAL   T_MAP_FCN_ERR
                  00000000'EF  DD  1519                    PUSHL    BEO_UNIT_NO
                           01  DD  151F                    PUSHL    #$ER
                                   1521       ;;; TEST 8, SUBTEST 18, ERROR 1
        000100D0 9F         04 FB  1521                    CALLS    #$$M, @#DS$ERRHARD
                                   1528  3344
                                   1528  3345          $DS_ABORT        TEST                              ; abort test
                           50  D4  1528                    CLRL     R0                     ; SEND A WARNING TO THE SUPERVISOR
                           04      152A                    RET                             ; TERMINATE TEST
                                   152B  3346 ;
                                   152B  3347 ; Initiate DATI transaction, wait
                                   152B  3348 ;
                 00001850'EF   16  152B  3349 40$:     JSB      UBE_SET_UP                        ; execute DATI
                                   1531  3350          $DS_WAITMS_S     TIME=#1                   ; wait
                           00  DD  1531                    PUSHL    #0
                           01  DD  1533                    PUSHL    #1
        00010060 9F         02 FB  1535                    CALLS    #2, @#DS$WAITMS
                                   153C  3351 ;
                                   153C  3352 ; Check for execution or data errors, report if any
                                   153C  3353 ;
   0000004E'EF    00F26010 9F  D0  153C  3354          MOVL     @#A_UBI_CSR,L_SAVE_CSR            ; save UBI CSR
   0000029F'EF    000002AF'FF  B1  1547  3355          CMPW     @A_BEO_DB,W_PTRN_TBL              ; check UBE Data register
                           12  13  1552  3356          BEQL     50$                               ; br = no data error
     00000000'EF    1000 8F    A8  1554  3357          BISW2    #M_DATA_ERR,W_FLAGS               ; set data error flag
          52    000002AF'FF    3C  155D  3358          MOVZWL   @A_BEO_DB,R2                      ; extend actual data
                           15  11  1564  3359          BRB      60$                               ; br to error report
   0000004E'EF    8001C000 8F  D3  1566  3360 50$:     BITL     #M_UBI_STS,L_SAVE_CSR             ; check UBI status
                           08  12  1571  3361          BNEQ     60$                               ; br = UBI error
        37 000002BF'FF      0F E1  1573  3362          BBC      #V_ERR,@A_BEO_CR1,65$             ; br = no UBE error
                                   157B  3363
                                   157B  3364 60$:     $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-        ; report data error
                                   157B  3365                           MSGADR=T_MAP_FCN_ERR,-
                                   157B  3366                           PRLINK=XFER_ERR,-
                                   157B  3367                           P1=A_BEO_DB,-             ; location
                                   157B  3368                           P2=W_PTRN_TBL,-           ; expected value
                                   157B  3369                           P3=R2,-                   ; actual value
                                   157B  3370                           P4=#T_WORD_ERR,-          ; data type
                                   157B  3371                           P5=R4                     ; map number used
                           54  DD  157B                    PUSHL    R4
                  00000DA0'8F  DD  157D                    PUSHL    #T_WORD_ERR
                           52  DD  1583                    PUSHL    R2
                  0000029F'EF  DD  1585                    PUSHL    W_PTRN_TBL
                 000002AF'EF    DD  158B                                PUSHL   A_BEO_DB
                 00001420'EF    DF  1591                                PUSHAL  XFER_ERR
                 0000075A'EF    DF  1597                                PUSHAL  T_MAP_FCN_ERR
                 00000000'EF    DD  159D                                PUSHL   BEO_UNIT_NO
                          02    DD  15A3                                PUSHL   #$ER
                                    15A5        ;;; TEST 8, SUBTEST 18, ERROR 2
         000100D0 9F      09    FB  15A5                                CALLS   #$$M, @#DS$ERRHARD
                                    15AC  3372
                 00000000'EF    B4  15AC  3373              CLRW    W_FLAGS                                 ; clear flags word
                                    15B2  3374 65$:         $DS_CKLOOP          10$                         ; scope loop at 10$
    00010040 9F      FF05 CF    FA  15B2                                CALLG   10$, @#DS$CKLOOP
                                    15BB  3375
             00F26800 9F44      D4  15BB  3376 70$:         CLRL    @#A_MAP_BGN[R4]                         ; invalidate Map Entry
                          54    D6  15C2  3377              INCL    R4                                      ; increment index
         00000200 8F      54    D1  15C4  3378 90$:         CMPL    R4,#512                                 ; done ?
                          03    13  15CB  3379              BEQL    100$                                    ; br = done
                        FEEB    31  15CD  3380              BRW     10$                                     ; br = not done
                                    15D0  3381 100$:
                                    15D0  3382              $DS_ENDSUB
                                    15D0        T8_S18_X:
00010038 9F      000000CC'EF    FA  15D0                                CALLG   $S$, @#DS$ENDSUB
                                    15DB  3383
                                    15DB  3384              $DS_PAGE
```

```
                                         15DB            .SBTTL  SUBTEST 8.19:  Page Boundary Write Error
                                         15DB  3387 ;+
                                         15DB  3388 ; Subtest description:
                                         15DB  3389 ;
                                         15DB  3390 ;        This subtest checks that a byte offset write across a page boundary
                                         15DB  3391 ;        will cause an error if the second page is invalidated.
                                         15DB  3392 ;
                                         15DB  3393 ; Subtest steps:
                                         15DB  3394 ;
                                         15DB  3395 ;        SUBTEST Page Boundary Write Error
                                         15DB  3396 ;        :  Set up first valid Map Entry to point to valid page
                                         15DB  3397 ;        :  Set up DATO to last byte in this page in byte-offset mode
                                         15DB  3398 ;        :  Invalidate the page immediately following
                                         15DB  3399 ;        :  Initiate DATO
                                         15DB  3400 ;        :  IF no error condition generated
                                         15DB  3401 ;        :  :  THEN REPORT error
                                         15DB  3402 ;        :  ENDIF
                                         15DB  3403 ;        :  IF UBI CSR not cleared when read
                                         15DB  3404 ;        :  :  THEN REPORT error
                                         15DB  3405 ;        :  ENDIF
                                         15DB  3406 ;        :  IF unexpected SSYN asserted
                                         15DB  3407 ;        :  :  THEN REPORT error
                                         15DB  3408 ;        :  ENDIF
                                         15DB  3409 ;        ENDSUBTEST Page Boundary Write Error
                                         15DB  3410 ;
                                         15DB  3411 ; Errors:
                                         15DB  3412 ;
                                         15DB  3413 ;-
                                         15DB  3414          $DS_BGNSUB
                                         15DB       T8_S19::
     00010030 9F    000000D8'EF     FA   15DB                    CALLG   $S$, @#DS$BGNSUB
                                         15E6  3415
                    00000000'EF     B4   15E6  3416          CLRW    W_FLAGS                          ; clear flags word
          00000000'EF     0080 8F   A8   15EC  3417          BISW2   #M_EXP_WR_ERR,W_FLAGS            ; set expect write error flag
                           37  00   DA   15F5  3418          MTPR    #0,#PR$L_UB_INIT                 ; initialize Unibus devices
                    00000000'FF     D4   15F8  3419          CLRL    @A_UBE_BUFFER_0                  ; clear buffer longword
                                         15FE  3420 ;
                                         15FE  3421 ; Set up Map Entry in Byte-offset mode, invalidate next entry
                                         15FE  3422 ;
               54   00000002'EF     D0   15FE  3423          MOVL    FRST_VAL_MAP,R4                  ; load Map Number
   9F44     00000000'EF    0F  09   EF   1605  3424          EXTZV   #9,#15,A_UBE_BUFFER_0,@#A_MAP_BGN[R4] ; load PFN into Map Entry
                             00F26800    160F
    00F26800 9F44   80000000 8F     C8   1613  3425          BISL2   #M_MAP_VAL,@#A_MAP_BGN[R4]       ; validate Map Entry
    00F26800 9F44   02000000 8F     C8   161F  3426          BISL2   #M_BYTE_OFF,@#A_MAP_BGN[R4]      ; put in byte-offset mode
                               54   D6   162B  3427          INCL    R4                               ; incr index
                    00F26800 9F44   D4   162D  3428          CLRL    @#A_MAP_BGN[R4]                  ; invalidate next Map Entry
                                         1634  3429 ;
                                         1634  3430 ; Load address into DATO Command table
                                         1634  3431 ;
               59   000002EF'EF     DE   1634  3432          MOVAL   UBE_DATO_1,R9                    ; load command table address
          55   00000000'EF     02   C3   163B  3433          SUBL3   #2,A_UBE_BUFFER_1,R5             ; adr of last word buffer 1
                        06 A9  55   B0   1643  3434          MOVW    R5,6(R9)                         ; load offset within page
  06 A9    09    09   00000002'EF   F0   1647  3435          INSV    FRST_VAL_MAP,#9,#9,6(R9)         ; load Map Number
                                         1651  3436 ;
                                         1651  3437 ; If ready bit not set then report error and abort test
                                         1651  3438 ;
           29 000002BF'FF      07   E0   1651  3439 2$:      BBS     #V_RDY,@A_BEO_CR1,3$             ; br = ready bit set
```

```
                                     1659  3440
     0000004E'EF     00F26010 9F    D0 1659  3441           MOVL     @#A_UBI_CSR,L_SAVE_CSR             ; save UBI CSR
                                     1664  3442           $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-        ; report no-RDY error
                                     1664  3443                            MSGADR=T_PG_BND_WR_ERR,-
                                     1664  3444                            PRLINK=XFER_ERR
                 00001420'EF    DF  1664                           PUSHAL   XFER_ERR
                 0000072B'EF    DF  166A                           PUSHAL   T_PG_BND_WR_ERR
                 00000000'EF    DD  1670                           PUSHL    BEO_UNIT_NO
                          01    DD  1676                           PUSHL    #$ER
                                     1678             ;;; TEST 8, SUBTEST 19, ERROR 1
          000100D0 9F     04    FB  1678                           CALLS    #$$M, @#DS$ERRHARD
                                     167F  3445
                                     167F  3446           $DS_ABORT            TEST                       ; abort test
                          50    D4  167F                           CLRL     R0                     ; SEND A WARNING TO THE SUPERVISOR
                          04        1681                           RET                             ; TERMINATE TEST
                                     1682  3447 ;
                                     1682  3448 ; Execute DATO, wait
                                     1682  3449 ;
                 00001850'EF    16  1682  3450 3$:        JSB      UBE_SET_UP                         ; execute DATIP/DATO
                                     1688  3451           $DS_WAITMS_S      TIME=#1                   ; wait
                          00    DD  1688                           PUSHL    #0
                          01    DD  168A                           PUSHL    #1
          00010060 9F     02    FB  168C                           CALLS    #2, @#DS$WAITMS
                                     1693  3452 ;
                                     1693  3453 ; Check that Write Error bit in UBI CSR set and cleared when read
                                     1693  3454 ;
     0000004E'EF     00F26010 9F    D0 1693  3455 7$:        MOVL     @#A_UBI_CSR,L_SAVE_CSR             ; save UBI CSR
          15 0000004E'EF     0E    E1  169E  3456           BBC      #V_UBI_WR_ERR,L_SAVE_CSR,8$        ; br = Write err bit never set
          0D 000002BB'FF     08    E1  16A6  3457           BBC      #V_NO_SSYN,@A_BEO_CR2,8$           ; br = unxp SSYN received
     00F26010 9F     8001C000 8F    D3 16AE  3458           BITL     #M_UBI_STS,@#A_UBI_CSR             ; did CSR clear when read?
                          1B    13  16B9  3459           BEQL     9$                                 ; br = CSR clear
                                     16BB  3460
                                     16BB  3461 8$:        $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-        ; report CSR bit error
                                     16BB  3462                            MSGADR=T_PG_BND_WR_ERR,-
                                     16BB  3463                            PRLINK=CSR_ERR
                 000015DF'EF    DF  16BB                           PUSHAL   CSR_ERR
                 0000072B'EF    DF  16C1                           PUSHAL   T_PG_BND_WR_ERR
                 00000000'EF    DD  16C7                           PUSHL    BEO_UNIT_NO
                          02    DD  16CD                           PUSHL    #$ER
                                     16CF             ;;; TEST 8, SUBTEST 19, ERROR 2
          000100D0 9F     04    FB  16CF                           CALLS    #$$M, @#DS$ERRHARD
                                     16D6  3464 9$:
                                     16D6  3465           $DS_ENDSUB
                                     16D6             T8_S19_X:
     00010038 9F     000000D8'EF    FA  16D6                           CALLG    $S$, @#DS$ENDSUB
                                     16E1  3466
                                     16E1  3467           $DS_PAGE
```

```
                                   16E1               .SBTTL  SUBTEST 8.20:  Map Parity Error
                                   16E1   3470 ;+
                                   16E1   3471 ; Subtest description:
                                   16E1   3472 ;
                                   16E1   3473 ;        This subtest checks that when the Unibus PB is asserted (simulating
                                   16E1   3474 ;        a Map Parity Error) and a transfer is attempted, the Map Parity Error
                                   16E1   3475 ;        bit in the UBI CSR will set and that it will clear when read.
                                   16E1   3476 ;
                                   16E1   3477 ; Subtest steps:
                                   16E1   3478 ;
                                   16E1   3479 ;        SUBTEST Map Parity Error
                                   16E1   3480 ;        :  Set FORCE TB PARITY in Memory CSR
                                   16E1   3481 ;        :  LOAD Map Entry
                                   16E1   3482 ;        :  CLEAR TB Parity bit
                                   16E1   3483 ;        :  EXECUTE DATI
                                   16E1   3484 ;        :  WAIT
                                   16E1   3485 ;        :  IF Map Parity Error bit not set
                                   16E1   3486 ;        :  :  THEN REPORT error
                                   16E1   3487 ;        :  ENDIF
                                   16E1   3488 ;        :  IF Map Parity Error did not clear when read
                                   16E1   3489 ;        :  :  THEN REPORT error
                                   16E1   3490 ;        :  ENDIF
                                   16E1   3491 ;        :  IF unexpected SSYN asserted
                                   16E1   3492 ;        :  :  THEN REPORT error
                                   16E1   3493 ;        :  ENDIF
                                   16E1   3494 ;        ENDSUBTEST Map Parity Error
                                   16E1   3495 ;
                                   16E1   3496 ; Errors:
                                   16E1   3497 ;
                                   16E1   3498 ;-
                                   16E1   3499         $DS_BGNSUB
                                   16E1        T8_S20::
   00010030 9F    000000E4'EF  FA  16E1                       CALLG   $S$, @#DS$BGNSUB
                                   16EC   3500
                   37    00    DA  16EC   3501         MTPR    #0,#PR$L_UB_INIT                  ; initialize Unibus devices
                   00000000'EF B4  16EF   3502         CLRW    W_FLAGS                           ; clear flags word
                   00000000'FF D4  16F5   3503         CLRL    @A_UBE_BUFFER_0                   ; clear buffer longword
      00000000'EF      0400 8F A8  16FB   3504         BISW2   #M_EXP_PB_ERR,W_FLAGS             ; set expect PB error flag
                                   1704   3505 ;
                                   1704   3506 ; If Ready bit not set then report error and abort test
                                   1704   3507 ;
        29 000002BF'FF   07    E0  1704   3508         BBS     #V_RDY,@A_BE0_CR1,4$              ; br = ready bit set
                                   170C   3509
   0000004E'EF    00F26010 9F  D0  170C   3510         MOVL    @#A_UBI_CSR,L_SAVE_CSR            ; save UBI CSR
                                   1717   3511         $DS_ERRHARD_S   UNIT=BE0_UNIT_NO,-        ; report no-RDY error
                                   1717   3512                         MSGADR=T_PB_ERR,-
                                   1717   3513                         PRLINK=XFER_ERR
                   00001420'EF DF  1717                       PUSHAL  XFER_ERR
                   00000786'EF DF  171D                       PUSHAL  T_PB_ERR
                   00000000'EF DD  1723                       PUSHL   BE0_UNIT_NO
                            01 DD  1729                       PUSHL   #$ER
                                   172B        ;;; TEST 8, SUBTEST 20, ERROR 1
         000100D0 9F     04    FB  172B                       CALLS   #$$M, @#DS$ERRHARD
                                   1732   3514
                                   1732   3515         $DS_ABORT       TEST                      ; abort test
                         50    D4  1732                       CLRL    R0                 ; SEND A WARNING TO THE SUPERVISOR
                               04  1734                       RET                        ; TERMINATE TEST
```

```
                                        1735  3516 ;
                                        1735  3517 ; Simulate Map Parity conditions
                                        1735  3518 ;
   00F20004 9F    20000000 8F      C8   1735  3519 4$:      BISL2   #M_FRCE_TB_ERR,@#A_MEM_CSR_1     ; set FORCE TB PARITY bit
        00000000'EF    0F   09     EF   1740  3520          EXTZV   #9,#15,A_UBE_BUFFER_0,L_PAGE_NO ; extract Page Frame Number
                  0000004A'EF           1748
   0000004A'EF    80000000 8F      C8   174D  3521          BISL2   #M_MAP_VAL,L_PAGE_NO             ; set map valid bit
             54   00000002'EF      D0   1758  3522          MOVL    FRST_VAL_MAP,R4                  ; load first valid map number
 00F26800 9F44    0000004A'EF      D0   175F  3523          MOVL    L_PAGE_NO,@#A_MAP_BGN[R4]        ; load Map Entry
   00F20004 9F    20000000 8F      CA   176B  3524          BICL2   #M_FRCE_TB_ERR,@#A_MEM_CSR_1     ; clear FORCE TB PARITY bit
                                        1776  3525 ;
                                        1776  3526 ; Load address into DATI command table.
                                        1776  3527 ;
                            58     D4   1776  3528          CLRL    R8                               ; clear device number
             59   000002CB'EF      DE   1778  3529          MOVAL   UBE_DATI_1,R9                    ; load command table address
 06 A9    09  09  00000002'EF      F0   177F  3530          INSV    FRST_VAL_MAP,#9,#9,6(R9)         ; load Map Number
                                        1789  3531 ;
                                        1789  3532 ; Execute DATI
                                        1789  3533 ;
                  00001850'EF      16   1789  3534 5$:      JSB     UBE_SET_UP
                                        178F  3535          $DS_WAITMS_S     TIME=#1                 ; wait
                            00     DD   178F                        PUSHL   #0
                            01     DD   1791                        PUSHL   #1
           00010060 9F      02     FB   1793                        CALLS   #2, @#DS$WAITMS
                                        179A  3536 ;
                                        179A  3537 ; Check for execution errors, report if any
                                        179A  3538 ;
   0000004E'EF    00F26010 9F      D0   179A  3539 7$:      MOVL    @#A_UBI_CSR,L_SAVE_CSR           ; save UBI CSR
        15 0000004E'EF    0F       E1   17A5  3540          BBC     #V_UBI_PB_ERR,L_SAVE_CSR,8$      ; br = Par bit never set
        0D 000002BB'FF    08       E1   17AD  3541          BBC     #V_NO_SSYN,@A_BEO_CR2,8$         ; br = unxp SSYN received
   00F26010 9F    8001C000 8F      D3   17B5  3542          BITL    #M_UBI_STS,@#A_UBI_CSR           ; did CSR clear when read?
                            1B     13   17C0  3543          BEQL    9$                               ; br = CSR clear
                                        17C2  3544
                                        17C2  3545 8$:      $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-      ; report CSR bit error
                                        17C2  3546                           MSGADR=T_PB_ERR,-
                                        17C2  3547                           PRLINK=CSR_ERR
                  000015DF'EF      DF   17C2                        PUSHAL  CSR_ERR
                  00000786'EF      DF   17C8                        PUSHAL  T_PB_ERR
                  00000000'EF      DD   17CE                        PUSHL   BEO_UNIT_NO
                            02     DD   17D4                        PUSHL   #$ER
                                        17D6           ;;; TEST 8, SUBTEST 20, ERROR 2
           000100D0 9F      04     FB   17D6                        CALLS   #$$M, @#DS$ERRHARD
                                        17DD  3548
                                        17DD  3549 9$:      $DS_ENDSUB
                                        17DD           T8_S20_X:
   00010038 9F    000000E4'EF      FA   17DD                        CALLG   $S$, @#DS$ENDSUB
                                        17E8  3550
                                        17E8  3551          $DS_PAGE
```

```
                                       17E8                 .SBTTL  SUBTEST 8.21:  NXM Error
                                       17E8  3554 ;+
                                       17E8  3555 ; Subtest description:
                                       17E8  3556 ;
                                       17E8  3557 ;         This subtest checks that when the UBE attempts to access a non-
                                       17E8  3558 ;         existent memory location, the NXM Error bit in the UBI CSR will set
                                       17E8  3559 ;         and that it will clear when read.
                                       17E8  3560 ;
                                       17E8  3561 ; Subtest steps:
                                       17E8  3562 ;
                                       17E8  3563 ;         SUBTEST NXM Error
                                       17E8  3564 ;         :  Set up DATI to access NXM address
                                       17E8  3565 ;         :  Initiate DATI
                                       17E8  3566 ;         :  WAIT
                                       17E8  3567 ;         :  IF NXM bit did not set
                                       17E8  3568 ;         :  :  THEN REPORT error
                                       17E8  3569 ;         :  ENDIF
                                       17E8  3570 ;         :  IF NXM bit did not clear when read
                                       17E8  3571 ;         :  :  THEN REPORT error
                                       17E8  3572 ;         :  ENDIF
                                       17E8  3573 ;         :  IF unexpected SSYN asserted
                                       17E8  3574 ;         :  :  THEN REPORT error
                                       17E8  3575 ;         :  ENDIF
                                       17E8  3576 ;         ENDSUBTEST NXM Error
                                       17E8  3577 ;
                                       17E8  3578 ; Errors:
                                       17E8  3579 ;
                                       17E8  3580 ;-
                                       17E8  3581           $DS_BGNSUB
                                       17E8       T8_S21::
   00010030 9F   000000F0'EF     FA    17E8                 CALLG   $S$, @#DS$BGNSUB
                                       17F3  3582
                   37   00       DA    17F3  3583           MTPR    #0,#PR$L_UB_INIT                ; initialize Unibus devices
               00000000'FF       D4    17F6  3584           CLRL    @A_UBE_BUFFER_0                 ; clear buffer longword
               00000000'EF       B4    17FC  3585           CLRW    W_FLAGS                         ; clear flags word
     00000000'EF    0200 8F      A8    1802  3586           BISW2   #M_EXP_NXM_ERR,W_FLAGS          ; set expect NXM error flag
          55   00000002'EF       D0    180B  3587           MOVL    FRST_VAL_MAP,R5                 ; load first valid Map Number
                                       1812  3588 ;
                                       1812  3589 ; Set up DATI from non-existent memory location
                                       1812  3590 ;
          59   000002CB'EF       3E    1812  3591           MOVAW   UBE_DATI_1,R9                   ; load adr of DATI command tbl
       06 A9   00000086'EF       B0    1819  3592           MOVW    L_NXM_ADR,6(R9)                 ; load offset within page
06 A9   09  09 00000002'EF       F0    1821  3593           INSV    FRST_VAL_MAP,#9,#9,6(R9)        ; load Map Number
     00000086'EF    0F   09      EF    182B  3594           EXTZV   #9,#15,L_NXM_ADR,L_PAGE_NO      ; extract page frame number
               0000004A'EF             1833
  00F26800 9F45  0000004A'EF     D0    1838  3595           MOVL    L_PAGE_NO,@#A_MAP_BGN[R5]       ; load Map Entry PFN
  00F26800 9F45  80000000 8F     C8    1844  3596           BISL2   #M_MAP_VAL,@#A_MAP_BGN[R5]      ; set Map Valid bit
                                       1850  3597 ;
                                       1850  3598 ; If ready bit not set then report error and abort test
                                       1850  3599 ;
        29 000002BF'FF    07     E0    1850  3600 4$:       BBS     #V_RDY,@A_BE0_CR1,5$            ; br = ready bit set
                                       1858  3601
   0000004E'EF   00F26010 9F     D0    1858  3602           MOVL    @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
                                       1863  3603           $DS_ERRHARD_S   UNIT=BE0_UNIT_NO,-      ; report no-RDY error
                                       1863  3604                           MSGADR=T_NXM_ERR,-
                                       1863  3605                           PRLINK=XFER_ERR
               00001420'EF       DF    1863                         PUSHAL  XFER_ERR
```

```
             000007B6'EF    DF  1869                              PUSHAL  T_NXM_ERR
             00000000'EF    DD  186F                              PUSHL   BEO_UNIT_NO
                     01     DD  1875                              PUSHL   #$ER
                                1877           ;;; TEST 8, SUBTEST 21, ERROR 1
       000100D0 9F   04     FB  1877                              CALLS   #$$M, @#DS$ERRHARD
                                187E  3606
                                187E  3607           $DS_ABORT            TEST                      ; abort test
                     50     D4  187E                              CLRL    R0                  ; SEND A WARNING TO THE SUPERVISOR
                     04         1880                              RET                         ; TERMINATE TEST
                                1881  3608 ;
                                1881  3609 ; Execute DATI, wait
                                1881  3610 ;
             00001850'EF    16  1881  3611 5$:       JSB     UBE_SET_UP                          ; execute DATI
                                1887  3612           $DS_WAITMS_S     TIME=#1                    ; wait
                     00     DD  1887                              PUSHL   #0
                     01     DD  1889                              PUSHL   #1
       00010060 9F   02     FB  188B                              CALLS   #2, @#DS$WAITMS
                                1892  3613 ;
                                1892  3614 ; Check that NXM bit set and cleared when read
                                1892  3615 ;
0000004E'EF    00F26010 9F  D0  1892  3616 7$:       MOVL    @#A_UBI_CSR,L_SAVE_CSR              ; save UBI CSR
      15 0000004E'EF  10    E1  189D  3617           BBC     #V_UBI_NXM_ERR,L_SAVE_CSR,8$        ; br = NXM bit never set
      0D 000002BB'FF  08    E1  18A5  3618           BBC     #V_NO_SSYN,@A_BEO_CR2,8$            ; br = unxp SSYN received
00F26010 9F    8001C000 8F  D3  18AD  3619           BITL    #M_UBI_STS,@#A_UBI_CSR              ; did CSR clear when read?
                     1B     13  18B8  3620           BEQL    9$                                  ; br = CSR clear
                                18BA  3621
                                18BA  3622 8$:       $DS_ERRHARD_S    UNIT=BEO_UNIT_NO,-         ; report execution error
                                18BA  3623                            MSGADR=T_NXM_ERR,-
                                18BA  3624                            PRLINK=CSR_ERR
             000015DF'EF    DF  18BA                              PUSHAL  CSR_ERR
             000007B6'EF    DF  18C0                              PUSHAL  T_NXM_ERR
             00000000'EF    DD  18C6                              PUSHL   BEO_UNIT_NO
                     02     DD  18CC                              PUSHL   #$ER
                                18CE           ;;; TEST 8, SUBTEST 21, ERROR 2
       000100D0 9F   04     FB  18CE                              CALLS   #$$M, @#DS$ERRHARD
                                18D5  3625
                                18D5  3626 9$:       $DS_ENDSUB
                                18D5           T8_S21_X:
00010038 9F    000000F0'EF  FA  18D5                              CALLG   $S$, @#DS$ENDSUB
                                18E0  3627
                                18E0  3628           $DS_PAGE
```

```
                                        18E0            .SBTTL  SUBTEST 8.22:  Map Invalid
                                        18E0  3631 ;+
                                        18E0  3632 ; Subtest description:
                                        18E0  3633 ;
                                        18E0  3634 ;        This subtest checks that the UBI refuses to issue SSYN if the UBE at-
                                        18E0  3635 ;        tempts to access a map entry which has the valid bit turned off.
                                        18E0  3636 ;
                                        18E0  3637 ; Subtest steps:
                                        18E0  3638 ;
                                        18E0  3639 ;        SUBTEST Map Invalid
                                        18E0  3640 ;        :  Invalidate first valid Map Entry
                                        18E0  3641 ;        :  Set up DATI to reference first valid Map Entry
                                        18E0  3642 ;        :  CLEAR UBE Data register
                                        18E0  3643 ;        :  Load pattern into memory location
                                        18E0  3644 ;        :  Execute DATI
                                        18E0  3645 ;        :  WAIT
                                        18E0  3646 ;        :  IF SSYN received
                                        18E0  3647 ;        :  :  THEN REPORT no-timeout error
                                        18E0  3648 ;        :  ENDIF
                                        18E0  3649 ;        ENDSUBTEST Map Invalid
                                        18E0  3650 ;
                                        18E0  3651 ; Errors:
                                        18E0  3652 ;
                                        18E0  3653 ;-
                                        18E0  3654          $DS_BGNSUB
                                        18E0       T8_S22::
    00010030 9F    000000FC'EF    FA    18E0                    CALLG   $S$, @#DS$BGNSUB
                                        18EB  3655
              00000000'FF    D4         18EB  3656          CLRL    @A_UBE_BUFFER_0                 ; clear buffer longword
              00000000'EF    B4         18F1  3657          CLRW    W_FLAGS                         ; clear flags word
                                        18F7  3658 ;
                                        18F7  3659 ; Set up DATI to reference invalid Map Entry
                                        18F7  3660 ;
          54  00000002'EF    D0         18F7  3661          MOVL    FRST_VAL_MAP,R4                 ; load first valid Map Number
            00F26800 9F44    D4         18FE  3662          CLRL    @#A_MAP_BGN[R4]                 ; invalidate Map Entry
          59  000002CB'EF    3E         1905  3663          MOVAW   UBE_DATI_1,R9                   ; load command table address
       06 A9  00000000'EF    B0         190C  3664          MOVW    A_UBE_BUFFER_0,6(R9)            ; load offset within page
       06 A9  09    09    54    F0      1914  3665          INSV    R4,#9,#9,6(R9)                  ; load Map Number
                                        191A  3666 ;
                                        191A  3667 ; If ready bit not set then report error and abort test
                                        191A  3668 ;
     29 000002BF'FF     07    E0        191A  3669 4$:      BBS     #V_RDY,@A_BEO_CR1,5$            ; br = ready bit set
                                        1922  3670
    0000004E'EF    00F26010 9F    D0    1922  3671          MOVL    @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
                                        192D  3672          $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-      ; report no-RDY error
                                        192D  3673                          MSGADR=T_MAP_INV_ERR,-
                                        192D  3674                          PRLINK=XFER_ERR
              00001420'EF    DF         192D                    PUSHAL  XFER_ERR
              0000080D'EF    DF         1933                    PUSHAL  T_MAP_INV_ERR
              00000000'EF    DD         1939                    PUSHL   BEO_UNIT_NO
                       01    DD         193F                    PUSHL   #$ER
                                        1941       ;;; TEST 8, SUBTEST 22, ERROR 1
        000100D0 9F    04    FB         1941                    CALLS   #$$M, @#DS$ERRHARD
                                        1948  3675
                                        1948  3676          $DS_ABORT       TEST                    ; abort test
                       50    D4         1948                    CLRL    R0              ; SEND A WARNING TO THE SUPERVISOR
                             04         194A                    RET                     ; TERMINATE TEST
                             194B  3677 ;
                             194B  3678 ; Execute DATI, wait
                             194B  3679 ;
         00001850'EF     16  194B  3680 5$:     JSB     UBE_SET_UP                      ; Execute DATI
                             1951  3681         $DS_WAITMS_S    TIME=#1                 ; wait
                  00     DD  1951                       PUSHL   #0
                  01     DD  1953                       PUSHL   #1
      00010060 9F 02     FB  1955                       CALLS   #2, @#DS$WAITMS
                             195C  3682 ;
                             195C  3683 ; If SSYN asserted then report error
                             195C  3684 ;
0000004E'EF    00F26010 9F   D0  195C  3685         MOVL    @#A_UBI_CSR,L_SAVE_CSR          ; save UBI CSR
   1B 000002BB'FF     08     E0  1967  3686         BBS     #V_NO_SSYN,@A_BEO_CR2,7$        ; br = SSYN not asserted
                             196F  3687
                             196F  3688         $DS_ERRHARD_S   UNIT=BEO_UNIT_NO,-      ; report execution error
                             196F  3689                         MSGADR=T_MAP_INV_ERR,-
                             196F  3690                         PRLINK=CSR_ERR
         000015DF'EF     DF  196F                       PUSHAL  CSR_ERR
         0000080D'EF     DF  1975                       PUSHAL  T_MAP_INV_ERR
         00000000'EF     DD  197B                       PUSHL   BEO_UNIT_NO
                  02     DD  1981                       PUSHL   #$ER
                             1983       ;;; TEST 8, SUBTEST 22, ERROR 2
      000100D0 9F 04     FB  1983                       CALLS   #$$M, @#DS$ERRHARD
                             198A  3691
                             198A  3692 7$:
                             198A  3693         $DS_ENDSUB
                             198A       T8_S22_X:
00010038 9F    000000FC'EF   FA  198A                       CALLG   $S$, @#DS$ENDSUB
                             1995  3694
                             1995  3695         $DS_ENDTEST
               50 01     D0  1995                       MOVL    #1, R0          ; NORMAL EXIT
                             1998       TEST_008_X::
      00010058 9F 6E     FA  1998                       CALLG   (SP), @#DS$BREAK
                         04  199F                       RET                     ; RETURN TO TEST SEQUENCER
                             19A0  3696
                             19A0  3697         $DS_CHANNEL_S   UNIT=BEO_UNIT_NO,-      ; disable interrupts
                             19A0  3698                         FUNC=#CHC$_DSINT,-
                             19A0  3699                         VECADR=BR_SERVICE,-
                             19A0  3700                         STSADR=L_UBI_STATUS
         000000AF'EF     7F  19A0                       PUSHAQ  L_UBI_STATUS
         00001A3C'EF     DF  19A6                       PUSHAL  BR_SERVICE
         00000000'8F     DD  19AC                       PUSHL   #CHC$_DSINT
         00000000'EF     DD  19B2                       PUSHL   BEO_UNIT_NO
      00010180 9F 04     FB  19B8                       CALLS   #4, @#DS$CHANNEL
                             19BF  3701
                             19BF  3702         $DS_PAGE
                             19BF                 .SBTTL  TEST 9:  UBE Multi-transfer Test
                         00000000                         .PSECT  TEST_009, PAGE, NOWRT
                             001C
                             001C  3705 ;++
                             001C  3706 ; Test description:
                             001C  3707 ;
                             001C  3708 ;       This test supports up to four UBE's if they are attached and selected
                             001C  3709 ;       for testing. It consists of two subtests, the first is a multi-transfer
                             001C  3710 ;       subtest that starts traffic on the bus simultaneously and the second
                             001C  3711 ;       is a multi-transfer subtest that will have UBE's doing various trans-
                             001C  3712 ;       fers and/or interrupts at different request levels. Both subtests are
                             001C  3713 ;       designed to check CPU handling capabilities. This test is modeled after
                             001C  3714 ;       the existing PDP-11 Unibus System Exerciser, CZKUAE0.  Note that the
                             001C  3715 ;       UBEs MUST be addressed and vectored as specified in the BUS EXERCISER
                             001C  3716 ;       ENGINEERING SPECIFICATION, i.e., the first device must be at address
                             001C  3717 ;       777000 (octal) with vector 510 (octal), the second at address 777020
                             001C  3718 ;       (octal) with vector 514 (octal), etc.
                             001C  3719 ;
                             001C  3720 ;--
                             001C  3721
                             001C  3722         $DS_BGNTEST     <DEFAULT,UBI,ALL>
                             001C       DATA_009:
               00000000      001C                       .LONG   0                   ; TEST ARGUMENT TABLE TERMINATOR
                             0020       TEST_009::
                   0000      0020                       .WORD   ^M<>                ; ENTRY MASK
                             0022  3723
                             0022  3724 ;
                             0022  3725 ; Report if no devices selected and exit test
                             0022  3726 ;
      00000000'EF    D5      0022  3727         TSTL    L_LAST_UBE                        ; 4 or more UBEs selected?
               10    18      0028  3728         BGEQ    10$                               ; br = selected
                             002A  3729         $DS_PRINTF_S    FORMAT=T_NO_UBE           ; print warning
      00000414'EF    9F      002A                       PUSHAB  T_NO_UBE
000100F0 9F    01    FB      0030                       CALLS   #$$N, @#DS$PRINTF
                             0037  3730         $DS_EXIT        TEST                      ; exit test if no UBE
             0635    31      0037                       BRW     TEST_009_X          ; EXIT TEST 9
                             003A  3731 ;
                             003A  3732 ; Size Unibus space
                             003A  3733 ;
      00001867'EF    16      003A  3734 10$:    JSB     UNIBUS_SIZER
                             0040  3735 ;
                             0040  3736 ; Set up UBE interrupt vectors
                             0040  3737 ;
                             0040  3738         $DS_SETVEC_S    VECTOR=#SCB$L_BE0,SRVADR=BE0_SERVICE
               00    DD      0040                       PUSHL   #0
      00001A74'EF    DF      0042                       PUSHAL  BE0_SERVICE
      00000348 8F    DD      0048                       PUSHL   #SCB$L_BE0
00010160 9F    03    FB      004E                       CALLS   #3, @#DS$SETVEC
                             0055  3739         $DS_SETVEC_S    VECTOR=#SCB$L_BE1,SRVADR=BE0_SERVICE
               00    DD      0055                       PUSHL   #0
      00001A74'EF    DF      0057                       PUSHAL  BE0_SERVICE
      0000034C 8F    DD      005D                       PUSHL   #SCB$L_BE1
00010160 9F    03    FB      0063                       CALLS   #3, @#DS$SETVEC
                             006A  3740         $DS_SETVEC_S    VECTOR=#SCB$L_BE2,SRVADR=BE0_SERVICE
               00    DD      006A                       PUSHL   #0
      00001A74'EF    DF      006C                       PUSHAL  BE0_SERVICE
      00000350 8F    DD      0072                       PUSHL   #SCB$L_BE2
```

```
        00010160 9F     03    FB  0078                        CALLS   #3, @#DS$SETVEC
                                  007F  3741        $DS_SETVEC_S    VECTOR=#SCB$L_BE3,SRVADR=BEO_SERVICE
                        00    DD  007F                        PUSHL   #0
             00001A74'EF        DF  0081                        PUSHAL  BEO_SERVICE
             00000354 8F        DD  0087                        PUSHL   #SCB$L_BE3
        00010160 9F     03    FB  008D                        CALLS   #3, @#DS$SETVEC
                                  0094  3742 ;
                                  0094  3743 ; Set up Interval Timer vector
                                  0094  3744 ;
                                  0094  3745        $DS_SETVEC_S    VECTOR=#SCB$L_TIMER,SRVADR=TIMER_SERVICE
                        00    DD  0094                        PUSHL   #0
             00001AA4'EF        DF  0096                        PUSHAL  TIMER_SERVICE
             000000C0 8F        DD  009C                        PUSHL   #SCB$L_TIMER
        00010160 9F     03    FB  00A2                        CALLS   #3, @#DS$SETVEC
                                  00A9  3746 ;
                                  00A9  3747 ; Load actual byte-offset buffer addresses into buffer address table
                                  00A9  3748 ;
                        58    D4  00A9  3749        CLRL    R8                              ; clear index
      51   000000CB'EF48    D0  00AB  3750 20$:   MOVL    A_BUFRS_DFR_1[R8],R1            ; load deferred address
  000000EB'EF48   61     01    C1  00B3  3751        ADDL3   #1,(R1),A_BUFFERS_1[R8]         ; load actual byte-offset address
              EB 58     08    F2  00BC  3752        AOBLSS  #8,R8,20$                       ; incr index, br = not done
                                  00C0  3753
                                  00C0  3754
                                  00C0  3755        $DS_PAGE
```

```
                                     00C0                .SBTTL  SUBTEST 9.1:  UBE Multi-transfer 1
                                     00C0        ;+
                                     00C0        ; Subtest description:
                                     00C0        ;
                                     00C0        ;       This subtest will attempt to create traffic on the Unibus and check
                                     00C0        ;       that the CPU can handle the data transactions without errors. All se-
                                     00C0        ;       lected UBE's are set up and started simultaneously to cause the bus
                                     00C0        ;       traffic. The functions cycle through the map entries using byte offset
                                     00C0        ;       mode and are set up as follows:
                                     00C0        ;
                                     00C0        ;       UBE 0 - DATIP/DATOB single word BR6 transfer with a rotate data
                                     00C0        ;                         left after DATIP, interrupt on done, 2000 cycles.
                                     00C0        ;
                                     00C0        ;       UBE 1 - DATIP/DATO single word NPR transfer without rotate,
                                     00C0        ;                         interrupt on done BR7, 2000 cycles.
                                     00C0        ;
                                     00C0        ;       UBE 2 - DATO single word NPR transfer, interrupt on done BR7,
                                     00C0        ;                         1000 cycles.
                                     00C0        ;
                                     00C0        ;       UBE 3 - DATO single word BR5 transfer, interrupt on done BR5,
                                     00C0        ;                         1000 cycles.
                                     00C0        ;
                                     00C0        ; Subtest steps:
                                     00C0        ;
                                     00C0        ;       BGNSUBTEST Multitransfer 1
                                     00C0        ;       :  DO FOR UBE Number = {0,1,2,3}
                                     00C0        ;       :  :  PROBE Data Register
                                     00C0        ;       :  :  IF NO ACCESS
                                     00C0        ;       :  :  :  THEN DO
                                     00C0        ;       :  :  :  :  REPORT ERROR
                                     00C0        ;       :  :  :  :  EXIT Test
                                     00C0        ;       :  :  :  ENDDO
                                     00C0        ;       :  :  ENDIF
                                     00C0        ;       :  ENDDO
                                     00C0        ;       :  DO FOR UBE Number = {0,1,2,3}
                                     00C0        ;       :  :  Set up UBE transfer
                                     00C0        ;       :  ENDDO
                                     00C0        ;       :  START Timer
                                     00C0        ;       :  SET Simultaneous GO bit
                                     00C0        ;       :  WAIT UNTIL All transfers stopped
                                     00C0        ;       :  DO FOR UBE Number = {0,1,2,3}
                                     00C0        ;       :  :  IF Data or Execution error
                                     00C0        ;       :  :  :  THEN REPORT error
                                     00C0        ;       :  :  ENDIF
                                     00C0        ;       :  ENDDO
                                     00C0        ;       ENDSUBTEST Multitransfer 1
                                     00C0        ;
                                     00C0        ; Errors:
                                     00C0        ;
                                     00C0        ;-
                                     00C0                $DS_BGNSUB
                                     00C0        T9_S1::
00010030 9F      00000108'EF    FA   00C0                        CALLG   $S$, @#DS$BGNSUB
                                     00CB
                      37  01    DA   00CB                MTPR    #1,#PR$L_UB_INIT                ; initialize Unibus devices
                 0000008A'EF    D4   00CE                CLRL    L_MAP_NUM                       ; clear initial map number
0000008E'EF      33550FFF 8F    D0   00D4                MOVL    #L_PATTERN,L_PTRN               ; load initial pattern
```

```
                                    00DF  3812 ;
                                    00DF  3813 ; Attempt access to Data Register of each UBE.  Report error and exit if
                                    00DF  3814 ; not accessible.
                                    00DF  3815 ;
                          58   D4   00DF  3816         CLRL    R8                                      ; clear device number
          57   000002AF'EF     D0   00E1  3817         MOVL    A_BEO_DB,R7                             ; load first UBE address
                                    00E8  3818 1$:     $DS_PROBE_S     UNIT=BEO_UNIT_NO[R8],-          ; probe data register
                                    00E8  3819                         LENGTH=#2,-                     ; word access
                                    00E8  3820                         ADDRESS=(R7)
               00000000'EF48   DD   00E8                       PUSHL   BEO_UNIT_NO[R8]
                          02   DD   00EF                       PUSHL   #2
                          67   9F   00F1                       PUSHAB  (R7)
         000101A0 9F      03   FB   00F3                       CALLS   #3, @#DS$PROBE
                                    00FA  3821
                                    00FA  3822         $DS_BNERROR     3$
                          50   DD   00FA                       PUSHL   R0
                          01   DD   00FC                       PUSHL   #$ER
                 00000000'8F   DD   00FE                       PUSHL   #DS$K_BNERROR
         000100A8 9F      03   FB   0104                       CALLS   #3, @#DS$BRANCH
                       21 50   E8   010B                       BLBS    R0, 3$
                                    010E  3823
                                    010E  3824         $DS_ERRHARD_S   UNIT=BEO_UNIT_NO[R8],-          ; report no-access error
                                    010E  3825                         MSGADR=T_NO_ACCESS,-
                                    010E  3826                         PRLINK=NO_ACCESS,-
                                    010E  3827                         P1=R7
                          57   DD   010E                       PUSHL   R7
                 0000171B'EF   DF   0110                       PUSHAL  NO_ACCESS
                 000003C3'EF   DF   0116                       PUSHAL  T_NO_ACCESS
               00000000'EF48   DD   011C                       PUSHL   BEO_UNIT_NO[R8]
                          01   DD   0123                       PUSHL   #$ER
                                    0125       ;;; TEST 9, SUBTEST 1, ERROR 1
         000100D0 9F      05   FB   0125                       CALLS   #$$M, @#DS$ERRHARD
                                    012C  3828         $DS_EXIT        TEST                            ; exit test
                        0540   31   012C                       BRW     TEST_009_X      ; EXIT TEST 9
                      57  10   C0   012F  3829 3$:     ADDL2   #^X10,R7                                ; incr to next UBE
       AE 58     00000000'EF   F3   0132  3830         AOBLEQ  L_LAST_UBE,R8,1$                        ; incr dev num, br = not done
                                    013A  3831 ;
                                    013A  3832 ; Load buffer, set up for next transfer.
                                    013A  3833 ;
                                    013A  3834 9$:     $DS_BREAK                                       ; look for control-c
         00010058 9F      6E   FA   013A                       CALLG   (SP), @#DS$BREAK
                          58   D4   0141  3835         CLRL    R8                                      ; clear device number
                 000000A2'EF   94   0143  3836         CLRB    B_DONE_CT                               ; clear done count
                 00000000'EF   B4   0149  3837         CLRW    W_FLAGS                                 ; clear flags word
   0000010B'EF   0000010F'EF   D0   014F  3838         MOVL    L_BUF_SIZES_1,L_BUFFER_SIZE             ; load current buffer size
   000000C7'EF   000000EB'EF   D0   015A  3839         MOVL    A_BUFFERS_1,L_BUFFER_ADR                ; load buffer start address
0000008E'EF  0000008E'EF  01   9C   0165  3840         ROTL    #1,L_PTRN,L_PTRN                        ; rotate data pattern
 00000092'EF48   0000008E'EF   D0   0171  3841         MOVL    L_PTRN,L_PTRNS[R8]                      ; save data pattern
                 000019B5'EF   16   017D  3842         JSB     LOAD_BUFFER                             ; load data into buffer
     00000000'EF    0F    09   EF   0183  3843         EXTZV   #9,#15,A_UBE_BUFFER_0,L_PAGE_NO         ; extract page frame number
                 0000004A'EF        018B
                                    0190  3844 ;
                                    0190  3845 ; Set up all UBEs and maps as needed
                                    0190  3846 ;
          59   00000337'EF     DE   0190  3847 10$:    MOVAL   UBE_0_MULT_1,R9                         ; load command table address
   000000C7'EF 000000EB'EF48   D0   0197  3848 13$:    MOVL    A_BUFFERS_1[R8],L_BUFFER_ADR            ; load buffer start address
   000000A3'EF 000000BF'EF48   9A   01A3  3849         MOVZBL  B_MAPS_REQ_1[R8],L_MAPS_NEEDED          ; load number of maps needed
```

```
                     0000194D'EF   16  01AF  3850         JSB     SET_UP_MAPS                     ; set up maps
                           03 50   E8  01B5  3851         BLBS    R0,15$                          ; br = maps set up
                            01E8   31  01B8  3852         BRW     100$                            ; br = no more usable maps
                        02    58   D1  01BB  3853 15$:    CMPL    R8,#2                           ; which device?
                              24   19  01BE  3854         BLSS    17$                             ; br = 0 or 1
 0000008E'EF   0000008E'EF    01   9C  01C0  3855         ROTL    #1,L_PTRN,L_PTRN                ; rotate data pattern
     00000092'EF48   0000008E'EF   D0  01CC  3856         MOVL    L_PTRN,L_PTRNS[R8]              ; save data pattern
              51   00000092'EF48   D0  01D8  3857         MOVL    L_PTRNS[R8],R1                  ; load data UBE 2 or 3
                     02 A9    51   B0  01E0  3858         MOVW    R1,2(R9)                        ; load data UBE 2 or 3
       09    09    0000014F'EF48   F0  01E4  3859 17$:    INSV    L_INITL_MAP[R8],#9,#9,6(R9)     ; load initial map number
                           06 A9       01ED
                     00001850'EF   16  01EF  3860         JSB     UBE_SET_UP                      ; load UBE registers
             9A 58   00000000'EF   F3  01F5  3861 20$:    AOBLEQ  L_LAST_UBE,R8,13$               ; incr dev num, br = not done
                                       01FD  3862 ;
                                       01FD  3863 ; Set timer, start transfers simultaneously, wait until all transfers complete
                                       01FD  3864 ; or Interval Timer expires
                                       01FD  3865 ;
       00000000'8F   80000080 8F   DA  01FD  3866         MTPR    #<M_CLK_ERR+M_CLK_INTR>,#PR$_ICCS ; stop clock
       00000000'8F   000000BB'EF   DA  0208  3867         MTPR    L_MXFR_TIME,#PR$_NICR           ; load time
               00000000'8F    10   DA  0213  3868         MTPR    #M_TRANSFER,#PR$_ICCS           ; transfer time to ICR
               00000000'8F    01   DA  021A  3869         MTPR    #1,#PR$_NICR                    ; load long next interval
               00000000'EF    04   AA  0221  3870         BICW2   #M_TIMEOUT,W_FLAGS              ; clear timeout flag
       00000000'8F   80000041 8F   DA  0228  3871         MTPR    #<M_CLK_ERR+M_ENABLE+M_RUN>,#PR$_ICCS ; start timer
                                       0233  3872
                     00FFF00C 9F   B6  0233  3873         INCW    @#A_SIMUL_GO                    ; start all UBEs
                                       0239  3874
            18 00000000'EF    02   E0  0239  3875 30$:    BBS     #V_TIMEOUT,W_FLAGS,40$          ; br = timer expired
       00000000'EF   000000A2'EF   91  0241  3876         CMPB    B_DONE_CT,L_LAST_UBE            ; all transfers stopped ?
                              EB   15  024C  3877         BLEQ    30$                             ; br = transfers not stopped
       00000000'8F   80000080 8F   DA  024E  3878         MTPR    #<M_CLK_ERR+M_CLK_INTR>,#PR$_ICCS ; stop clock
                                       0259  3879 ;
                                       0259  3880 ; Check buffer 0 for data errors, report if any.  Note that 1/2 of buffer will
                                       0259  3881 ; have rotated data and the second 1/2 will be the original data due to the use
                                       0259  3882 ; of DATOB after DATIP.
                                       0259  3883 ;
                              58   D4  0259  3884 40$:    CLRL    R8                              ; initialize index
             00000092'EF48    01   9C  025B  3885         ROTL    #1,L_PTRNS[R8],L_EXP_DATA       ; first rotation
                     0000005E'EF       0263
    52   0000005E'EF    01    10   EF  0268  3886         EXTZV   #16,#1,L_EXP_DATA,R2            ; extract end-around carry
   0000005E'EF    01    00    52   F0  0271  3887         INSV    R2,#0,#1,L_EXP_DATA             ; insert end-around carry
    52   0000005E'EF    01    07   EF  027A  3888         EXTZV   #7,#1,L_EXP_DATA,R2             ; extract low-byte carry
   0000005E'EF    01    08    52   F0  0283  3889         INSV    R2,#8,#1,L_EXP_DATA             ; insert low-byte carry
            0000010F'EF    FF 8F   9C  028C  3890         ROTL    #-1,L_BUF_SIZES_1,L_BUFFER_SIZE ; load 1/2 buffer 0 size
                     0000010B'EF       0294
     000000C7'EF   000000EB'EF48   D0  0299  3891         MOVL    A_BUFFERS_1[R8],L_BUFFER_ADR    ; load buffer address
                     000019CA'EF   16  02A5  3892         JSB     CHECK_BUFFER                    ; check buffer contents
                           29 50   E8  02AB  3893         BLBS    R0,42$                          ; br = no errors found
                                       02AE  3894
                                       02AE  3895         $DS_ERRHARD_S   UNIT=BE0_UNIT_NO,-
                                       02AE  3896                         MSGADR=T_MULT1_ERR,-
                                       02AE  3897                         PRLINK=MXFR_ERR,-
                                       02AE  3898                         P1=T_MXFR_1_DESC[R8],-
                                       02AE  3899                         P2=A_BUFFERS_1[R8]
                   000000EB'EF48   DD  02AE                       PUSHL   A_BUFFERS_1[R8]
                   0000012F'EF48   DD  02B5                       PUSHL   T_MXFR_1_DESC[R8]
                     0000154A'EF   DF  02BC                       PUSHAL  MXFR_ERR
                     0000083A'EF   DF  02C2                       PUSHAL  T_MULT1_ERR
```

```
                00000000'EF    DD  02C8                         PUSHL   BE0_UNIT_NO
                         02    DD  02CE                         PUSHL   #$ER
                                   02D0        ;;; TEST 9, SUBTEST 1, ERROR 2
           000100D0 9F   06    FB  02D0                         CALLS   #$$M, @#DS$ERRHARD
                                   02D7  3900
  000000C7'EF     0000010F'EF  C0  02D7  3901 42$:    ADDL2   L_BUF_SIZES_1,L_BUFFER_ADR       ; load adr of second half
0000005E'EF     00000092'EF48  D0  02E2  3902         MOVL    L_PTRNS[R8],L_EXP_DATA           ; load expected data
                000019CA'EF    16  02EE  3903         JSB     CHECK_BUFFER                     ; check buffer contents
                      29 50    E8  02F4  3904         BLBS    R0,44$                           ; br = no errors found
                                   02F7  3905
                                   02F7  3906         $DS_ERRHARD_S    UNIT=BE1_UNIT_NO,-
                                   02F7  3907                          MSGADR=T_MULTT_ERR,-
                                   02F7  3908                          PRLINK=MXFR_ERR,-
                                   02F7  3909                          P1=T_MXFR_1_DESC[R8],-
                                   02F7  3910                          P2=A_BUFFERS_1[R8]
              000000EB'EF48    DD  02F7                         PUSHL   A_BUFFERS_1[R8]
              0000012F'EF48    DD  02FE                         PUSHL   T_MXFR_1_DESC[R8]
                0000154A'EF    DF  0305                         PUSHAL  MXFR_ERR
                0000083A'EF    DF  030B                         PUSHAL  T_MULT1_ERR
                00000000'EF    DD  0311                         PUSHL   BE1_UNIT_NO
                         03    DD  0317                         PUSHL   #$ER
                                   0319        ;;; TEST 9, SUBTEST 1, ERROR 3
           000100D0 9F   06    FB  0319                         CALLS   #$$M, @#DS$ERRHARD
                                   0320  3911
                                   0320  3912 ;
                                   0320  3913 ; Check buffers 2, 3 for data errors, report if any
                                   0320  3914 ;
                      58   02  D0  0320  3915 44$:    MOVL    #2,R8                            ; load dev num
           00000000'EF   58    D1  0323  3916         CMPL    R8,L_LAST_UBE                    ; beyond last ube?
                         5F    14  032A  3917         BGTR    80$                              ; br = beyond last UBE
                                   032C  3918
0000010B'EF     0000010F'EF48  D0  032C  3919 45$:    MOVL    L_BUF_SIZES_1[R8],L_BUFFER_SIZE  ; load buffer size
0000005E'EF     00000092'EF48  D0  0338  3920         MOVL    L_PTRNS[R8],L_EXP_DATA           ; load expected data
000000C7'EF     000000EB'EF48  D0  0344  3921 47$:    MOVL    A_BUFFERS_1[R8],L_BUFFER_ADR     ; load buffer address
                000019CA'EF    16  0350  3922         JSB     CHECK_BUFFER                     ; check buffer contents
                      2A 50    E8  0356  3923         BLBS    R0,50$                           ; br = no errors found
                                   0359  3924
                                   0359  3925         $DS_ERRHARD_S    UNIT=BE0_UNIT_NO[R8],-
                                   0359  3926                          MSGADR=T_MULTT_ERR,-
                                   0359  3927                          PRLINK=MXFR_ERR,-
                                   0359  3928                          P1=T_MXFR_1_DESC[R8],-
                                   0359  3929                          P2=A_BUFFERS_1[R8]
              000000EB'EF48    DD  0359                         PUSHL   A_BUFFERS_1[R8]
              0000012F'EF48    DD  0360                         PUSHL   T_MXFR_1_DESC[R8]
                0000154A'EF    DF  0367                         PUSHAL  MXFR_ERR
                0000083A'EF    DF  036D                         PUSHAL  T_MULT1_ERR
              00000000'EF48    DD  0373                         PUSHL   BE0_UNIT_NO[R8]
                         04    DD  037A                         PUSHL   #$ER
                                   037C        ;;; TEST 9, SUBTEST 1, ERROR 4
           000100D0 9F   06    FB  037C                         CALLS   #$$M, @#DS$ERRHARD
                                   0383  3930
        A1 58   00000000'EF    F3  0383  3931 50$:    AOBLEQ  L_LAST_UBE,R8,45$                ; incr dev num, br = not done
                                   038B  3932 ;
                                   038B  3933 ; End test if usable maps exhausted
                                   038B  3934 ;
                                   038B  3935 80$:    $DS_BQUICK       100$
                         08    E0  038B                         BBS     #DSA$V_QUICK,-  ; BR IF QUICK
```

```
                 10 0000FE00 9F      038D                              @#DSA$GL_FLAGS, 100$
     000001F0 8F   0000008A'EF   D1  0393              CMPL    L_MAP_NUM,#496                  ; usable maps exhausted? [01]
                            03   18  039E              BGEQ    100$                            ; br = usable maps exhausted
                          FD97   31  03A0              BRW     9$                              ; br to beginning of loop
                                     03A3       100$:
                                     03A3              $DS_ENDSUB
                                     03A3       T9_S1_X:
     00010038 9F   00000108'EF   FA  03A3                      CALLG   $S$, @#DS$ENDSUB
                                     03AE
                                     03AE              $DS_PAGE
```

```
                                 03AE          .SBTTL  SUBTEST 9.2:  UBE Multi-transfer 2
                                 03AE  3945 ;+
                                 03AE  3946 ; Subtest description:
                                 03AE  3947 ;
                                 03AE  3948 ;       This subtest will have all selected UBE's doing various transfer and/or
                                 03AE  3949 ;       interrupts at different request levels to further check CPU handling
                                 03AE  3950 ;       ablity.  The functions cycle through the map entries using byte offset
                                 03AE  3951 ;       mode with each data pattern being rotated after each block transfer.
                                 03AE  3952 ;       The following functions are performed:
                                 03AE  3953 ;
                                 03AE  3954 ;       UBE 0 - DATOB double word NPR transfers, data from cycle count
                                 03AE  3955 ;                       register, interrupt on done BR6, 2000 cycles.
                                 03AE  3956 ;
                                 03AE  3957 ;       UBE 1 - DATIP/DATO single word NPR transfers, with rotate after
                                 03AE  3958 ;                       DATIP, interrupt on done BR7, 1000 cycles.
                                 03AE  3959 ;
                                 03AE  3960 ;       UBE 2 - DATI double word BR5 transfers, 1000 cycles, interrupt
                                 03AE  3961 ;                       on done BR5.
                                 03AE  3962 ;
                                 03AE  3963 ;       UBE 3 - DATI single word BR7 transfers with an interrupt after
                                 03AE  3964 ;                       each transfer, 3000 cycles.
                                 03AE  3965 ;
                                 03AE  3966 ; Subtest steps:
                                 03AE  3967 ;
                                 03AE  3968 ;       BGNSUBTEST Multitransfer 2
                                 03AE  3969 ;       :  DO FOR UBE Number = {0,1,2,3}
                                 03AE  3970 ;       :  :  Set up UBE transfer
                                 03AE  3971 ;       :  ENDDO
                                 03AE  3972 ;       :  START Timer
                                 03AE  3973 ;       :  SET Simultaneous GO bit
                                 03AE  3974 ;       :  WAIT UNTIL All transfers stopped
                                 03AE  3975 ;       :  DO FOR UBE Number = {0,1,2,3}
                                 03AE  3976 ;       :  :  IF Data or Execution error
                                 03AE  3977 ;       :  :  :  THEN REPORT error
                                 03AE  3978 ;       :  :  ENDIF
                                 03AE  3979 ;       :  ENDDO
                                 03AE  3980 ;       ENDSUBTEST Multitransfer 2
                                 03AE  3981 ;
                                 03AE  3982 ; Errors:
                                 03AE  3983 ;
                                 03AE  3984 ;-
                                 03AE  3985             $DS_BGNSUB
                                 03AE       T9_S2::
00010030 9F   00000114'EF    FA  03AE                       CALLG   $S$, @#DS$BGNSUB
                                 03B9  3986
                                 03B9  3987             $DS_SETVEC_S    VECTOR=#SCB$L_BE3,SRVADR=BE3_SERVICE
                      00     DD  03B9                       PUSHL   #0
              00001A7C'EF    DF  03BB                       PUSHAL  BE3_SERVICE
              00000354 8F    DD  03C1                       PUSHL   #SCB$L_BE3
     00010160 9F      03     FB  03C7                       CALLS   #3, @#DS$SETVEC
                                 03CE  3988
                   37 01     DA  03CE  3989       MTPR    #1,#PR$L_UB_INIT             ; initialize Unibus devices
              0000008A'EF    D4  03D1  3990       CLRL    L_MAP_NUM                    ; clear map number
0000008E'EF   33550FFF 8F    D0  03D7  3991       MOVL    #C_PATTERN,L_PTRN            ; load initial pattern
              000000B7'EF    D4  03E2  3992 1$:   CLRL    L_XFR_COUNT                  ; clear transfer count
                      58     D4  03E8  3993       CLRL    R8                           ; clear device number
              000000A2'EF    94  03EA  3994       CLRB    B_DONE_CT                    ; clear done count
```

```
                  00000000'EF   B4  03F0  3995           CLRW     W_FLAGS                               ; clear flags word
         59       00000367'EF   DE  03F6  3996           MOVAL    UBE_0_MULT_2,R9                       ; load command table address
                                    03FD  3997 ;
                                    03FD  3998 ; Set up all UBEs and maps as needed, load buffers for devs 1,2,3
                                    03FD  3999 ;
                                    03FD  4000 10$:      $DS_BREAK                                      ; look for control-c
             00010058 9F     6E     FA  03FD                       CALLG    (SP), @#DS$BREAK
     000000C7'EF     000000FB'EF48  D0  0404  4001           MOVL     A_BUFFERS_2[R8],L_BUFFER_ADR          ; load buffer start address
     000000A3'EF     000000C3'EF48  9A  0410  4002           MOVZBL   B_MAPS_REQ_2[R8],[_MAPS_NEEDED        ; load number of maps needed
                     0000194D'EF    16  041C  4003           JSB      SET_UP_MAPS                           ; set up maps
         09   09     0000014F'EF48  F0  0422  4004           INSV     L_INIT[_MAP[R8],#9,#9,6(R9)           ; load initial map number
                             06 A9      042B
                             03 50  E8  042D  4005           BLBS     R0,15$                                ; br = maps set up
                              01ED  31  0430  4006           BRW      100$                                  ; br = no more usable maps
0000008E'EF   0000008E'EF      01   9C  0433  4007 15$:      ROTL     #1,L_PTRN,L_PTRN                      ; rotate data pattern
    00000092'EF48  0000008E'EF      D0  043F  4008           MOVL     L_PTRN,L_PTRNS[R8]                    ; save data pattern
                                58  D5  044B  4009           TSTL     R8                                    ; which device?
                                0F  14  044D  4010           BGTR     17$                                   ; br = not dev 0
         51       00000092'EF48     D0  044F  4011           MOVL     L_PTRNS[R8],R1                        ; load data in BEO Data Reg
                     02 A9     51   B0  0457  4012           MOVW     RT,2(R9)                              ; load data in BEO Data Reg
                              0012  31  045B  4013           BRW      19$                                   ; br = dev 0
    0000010B'EF      0000011F'EF48  D0  045E  4014 17$:      MOVL     L_BUF_SIZES_2[R8],L_BUFFER_SIZE ; load current buffer size
                       000019B5'EF  16  046A  4015           JSB      LOAD_BUFFER                           ; load data into buffer
                       00001850'EF  16  0470  4016 19$:      JSB      UBE_SET_UP                            ; load actual UBE registers
                                58  D6  0476  4017 20$:      INCL     R8                                    ; incr dev num
              00000000'EF       58  D1  0478  4018           CMPL     R8,L_LAST_UBE                         ; last UBE set up
                                03  14  047F  4019           BGTR     25$                                   ; br = last UBE set up
                              FF79  31  0481  4020           BRW      10$
                                        0484  4021 ;
                                        0484  4022 ; Set up timer, start transfers simultaneously, wait until all transfers
                                        0484  4023 ; complete or Interval Timer expires
                                        0484  4024 ;
     00000000'8F     80000080 8F    DA  0484  4025 25$:      MTPR     #<M_CLK_ERR+M_CLK_INTR>,#PR$_ICCS ; stop clock
     00000000'8F     000000BB'EF    DA  048F  4026           MTPR     L_MXFR_TIME,#PR$_NICR                 ; load time
              00000000'8F       10  DA  049A  4027           MTPR     #M_TRANSFER,#PR$_ICCS                 ; transfer time to ICR
              00000000'8F       01  DA  04A1  4028           MTPR     #1,#PR$_NICR                          ; load long next interval
              00000000'EF       04  AA  04A8  4029           BICW2    #M_TIMEOUT,W_FLAGS                    ; clear timeout flag
     00000000'8F     80000041 8F    DA  04AF  4030           MTPR     #<M_CLK_ERR+M_ENABLE+M_RUN>,#PR$_ICCS ; start timer
                                        04BA  4031
                     00FFF00C 9F    B6  04BA  4032           INCW     @#A_SIMUL_GO                          ; start all UBEs
                                        04C0  4033
         18 00000000'EF         02  E0  04C0  4034 30$:      BBS      #V_TIMEOUT,W_FLAGS,40$                ; br = timer expired
     00000000'EF     000000A2'EF    91  04C8  4035           CMPB     B_DONE_CT,L_[AST_UBE                  ; all transfers stopped ?
                                EB  15  04D3  4036           BLEQ     30$                                   ; br = transfers not stopped
     00000000'8F     80000080 8F    DA  04D5  4037           MTPR     #<M_CLK_ERR+M_CLK_INTR>,#PR$_ICCS ; stop clock
                                        04E0  4038 ;
                                        04E0  4039 ; Check buffer 0 (data from CC) for data errors, report if any
                                        04E0  4040 ;
     000000C7'EF     000000FB'EF    D0  04E0  4041 40$:      MOVL     A_BUFFERS_2,L_BUFFER_ADR              ; load buffer address
     0000010B'EF     0000011F'EF    D0  04EB  4042           MOVL     L_BUF_SIZES_2,L_BUFFER_SIZE           ; load buffer size
                                58  D4  04F6  4043           CLRL     R8                                    ; initialize index
                       00001A00'EF  16  04F8  4044           JSB      CHECK_BUF_0                           ; check buffer 0
                             29 50  E8  04FE  4045           BLBS     R0,42$                                ; br = no errors found
                                        0501  4046
                                        0501  4047           $DS_ERRHARD_S     UNIT=BEO_UNIT_NO,-
                                        0501  4048                             MSGADR=T_MULTT_ERR,-
                                        0501  4049                             PRLINK=MXFR_ERR,-
```

```
                               0501  4050                          P1=T_MXFR_2_DESC[R8],-
                               0501  4051                          P2=A_BUFFERS_2[R8]
          000000FB'EF48   DD   0501                    PUSHL    A_BUFFERS_2[R8]
          0000013F'EF48   DD   0508                    PUSHL    T_MXFR_2_DESC[R8]
            0000154A'EF   DF   050F                    PUSHAL   MXFR_ERR
            0000083A'EF   DF   0515                    PUSHAL   T_MULTI_ERR
            00000000'EF   DD   051B                    PUSHL    BEO_UNIT_NO
                     01   DD   0521                    PUSHL    #$ER
                               0523         ;;; TEST 9, SUBTEST 2, ERROR 1
        000100D0 9F   06  FB   0523                    CALLS    #$$M, @#DS$ERRHARD
                               052A  4052
                               052A  4053 ;
                               052A  4054 ; Check buffer 1 for data errors, report if any
                               052A  4055 ;
                     58   D6   052A  4056 42$:   INCL     R8                                    ; incr dev num
        00000000'EF  58   D1   052C  4057        CMPL     R8,L_LAST_UBE                         ; beyond last UBE?
                     03   15   0533  4058        BLEQ     43$                                   ; br = not beyond last UBE
                   00D0   31   0535  4059        BRW      80$                                   ; br = beyond last UBE
      00000092'EF48  01   9C   0538  4060 43$:   ROTL     #1,L_PTRNS[R8],L_EXP_DATA             ; load expected data
            0000005E'EF        0540
 52   0000005E'EF  01  10  EF  0545  4061        EXTZV    #16,#1,L_EXP_DATA,R2                  ; extract end-around carry
  0000005E'EF  01  00  52  F0  054E  4062        INSV     R2,#0,#1,L_EXP_DATA                   ; insert end-around carry
0000010B'EF   0000011F'EF48 D0  0557  4063        MOVL     L_BUF_SIZES_2[R8],L_BUFFER_SIZE ; load buffer size
000000C7'EF   000000FB'EF48 D0  0563  4064        MOVL     A_BUFFERS_2[R8],L_BUFFER_ADR          ; load buffer address
            000019CA'EF   16   056F  4065        JSB      CHECK_BUFFER                          ; check buffer contents
                  2A 50   E8   0575  4066        BLBS     R0,45$                                ; br = no errors found
                               0578  4067
                               0578  4068        $DS_ERRHARD_S     UNIT=BEO_UNIT_NO[R8],-
                               0578  4069                          MSGADR=T_MULTI_ERR,-
                               0578  4070                          PRLINK=MXFR_ERR,-
                               0578  4071                          P1=T_MXFR_2_DESC[R8],-
                               0578  4072                          P2=A_BUFFERS_2[R8]
          000000FB'EF48   DD   0578                    PUSHL    A_BUFFERS_2[R8]
          0000013F'EF48   DD   057F                    PUSHL    T_MXFR_2_DESC[R8]
            0000154A'EF   DF   0586                    PUSHAL   MXFR_ERR
            0000083A'EF   DF   058C                    PUSHAL   T_MULTI_ERR
          00000000'EF48   DD   0592                    PUSHL    BEO_UNIT_NO[R8]
                     02   DD   0599                    PUSHL    #$ER
                               059B         ;;; TEST 9, SUBTEST 2, ERROR 2
        000100D0 9F   06  FB   059B                    CALLS    #$$M, @#DS$ERRHARD
                               05A2  4073
                               05A2  4074 ;
                               05A2  4075 ; Check UBE 2,3 data buffers
                               05A2  4076 ;
                     58   D6   05A2  4077 45$:   INCL     R8                                    ; incr dev num
        00000000'EF  58   D1   05A4  4078        CMPL     R8,L_LAST_UBE                         ; beyond last UBE?
                     5B   14   05AB  4079        BGTR     80$                                   ; br = beyond last UBE
              57  58  03  78   05AD  4080        ASHL     #3,R8,R7                              ; calc index from dev num
0000005E'EF   00000092'EF48 D0  05B1  4081        MOVL     L_PTRNS[R8],L_EXP_DATA                ; log expected data
0000005E'EF   000002AF'FF47 B1  05BD  4082        CMPW     @A_BEO_DB[R7],L_EXP_DATA              ; check UBE data bufer
                     D7   13   05C9  4083        BEQL     45$                                   ; br = no error
00000163'EF   000002AF'FF47 3E  05CB  4084        MOVAW    @A_BEO_DB[R7],L_ERROR_LOG             ; log address of error
        0000015F'EF  01   D0   05D7  4085        MOVL     #1,L_ERROR_CT                         ; load error count
                               05DE  4086
                               05DE  4087        $DS_ERRHARD_S     UNIT=BEO_UNIT_NO[R8],-  ; report error
                               05DE  4088                          MSGADR=T_MULTI_ERR,-
                               05DE  4089                          PRLINK=MXFR_ERR,-
```

```
                                05DE  4090                                P1=T_MXFR_2_DESC[R8],-
                                05DE  4091                                P2=A_BUFFERS_2[R8]
         000000FB'EF48     DD   05DE                            PUSHL    A_BUFFERS_2[R8]
         0000013F'EF48     DD   05E5                            PUSHL    T_MXFR_2_DESC[R8]
           0000154A'EF     DF   05EC                            PUSHAL   MXFR_ERR
           0000083A'EF     DF   05F2                            PUSHAL   T_MULT1_ERR
         00000000'EF48     DD   05F8                            PUSHL    BE0_UNIT_NO[R8]
                    03     DD   05FF                            PUSHL    #SER
                                0601        ;;; TEST 9, SUBTEST 2, ERROR 3
      000100D0 9F    06    FB   0601                            CALLS    #$$M, @#DS$ERRHARD
                                0608  4092
                                0608  4093  ;
                                0608  4094  ; End test if usable maps exhausted
                                0608  4095  ;
                                0608  4096  80$:     $DS_BQUICK          100$
                    08     E0   0608                            BBS      #DSA$V_QUICK,-   ; BR IF QUICK
          10 0000FE00 9F        060A                                     @#DSA$GL_FLAGS, 100$
  000001F0 8F    0000008A'EF   D1   0610  4097     CMPL     L_MAP_NUM,#496                    ; usable maps exhausted? [01]
                    03     18   061B  4098           BGEQ     100$                              ; br = usable maps exhausted
                  FDC2     31   061D  4099           BRW      1$                                ; br to beginning of loop
                                0620  4100  100$:
                                0620  4101
                                0620  4102           $DS_ENDSUB
                                0620        T9_S2_X:
  00010038 9F    00000114'EF   FA   0620                    CALLG    $S$, @#DS$ENDSUB
                                062B  4103
                                062B  4104           $DS_CLRVEC_S     VECTOR=#SCB$L_BE0
            00000348 8F    DD   062B                            PUSHL    #SCB$L_BE0
      00010168 9F    01    FB   0631                            CALLS    #1, @#DS$CLRVEC
                                0638  4105           $DS_CLRVEC_S     VECTOR=#SCB$L_BE1
            0000034C 8F    DD   0638                            PUSHL    #SCB$L_BE1
      00010168 9F    01    FB   063E                            CALLS    #1, @#DS$CLRVEC
                                0645  4106           $DS_CLRVEC_S     VECTOR=#SCB$L_BE2
            00000350 8F    DD   0645                            PUSHL    #SCB$L_BE2
      00010168 9F    01    FB   064B                            CALLS    #1, @#DS$CLRVEC
                                0652  4107           $DS_CLRVEC_S     VECTOR=#SCB$L_BE3
            00000354 8F    DD   0652                            PUSHL    #SCB$L_BE3
      00010168 9F    01    FB   0658                            CALLS    #1, @#DS$CLRVEC
                                065F  4108           $DS_CLRVEC_S     VECTOR=#SCB$L_TIMER
            000000C0 8F    DD   065F                            PUSHL    #SCB$L_TIMER
      00010168 9F    01    FB   0665                            CALLS    #1, @#DS$CLRVEC
                                066C  4109
                                066C  4110           $DS_ENDTEST
                    50     01    D0   066C                      MOVL     #1, R0          ; NORMAL EXIT
                                066F        TEST_009_X::
      00010058 9F    6E    FA   066F                            CALLG    (SP), @#DS$BREAK
                           04   0676                            RET                      ; RETURN TO TEST SEQUENCER
                                0677  4111
                                0677  4112           $DS_ENDMOD
                        00000000                                .PSECT   $TSTCNT, NOEXE, NOWRT, OVR, LONG
                    00000009    0000                            .LONG    $TN
                                0004  4113           .END
```

```
$$$                 = 00000114 R     06     CHI$V_IPL             ********    X  02
$$ARGS              = 0000000A              CODEVECTORS           00000297 R     02
$$E                 = 00000001              CPU$V_COMET         = 00000002
$$M                 = 00000006              CPU$V_HS            = 00000000
$$N                 = 00000001              CPU$V_STAR          = 00000001
$$S                 = FFFFFFFF              CSR_CHK               00001471 R     02
$$T1                = 0000002C              CSR_ERR               000015DF R     02
$ENV                = 00000001  G           DATA_008              0000001C R     04
$ER                 = FFFFFFFF              DATA_009              0000001C R     07
$MO                 = 00000001  G           DATA_ERR              000013C0 R     02
$S$                 = 00000114 R     06     DECODE_TBL            00000277 R     02
$ST                 = 00000000              DEFAULT             = 00000000  G
$TN                 = 00000009              DS$ABORT              00010020
ALL                 = 00000008  G           DS$ASKADR             00010090
ALL_MAPS              0000192A R     02     DS$ASKDATA            00010080
A_BEO_BA              000002B7 R     02     DS$ASKLGCL            00010098
A_BEO_CC              000002B3 R     02     DS$ASKSTR             000100A0
A_BEO_CLR_ERR         000002AB R     02     DS$ASKVLD             00010088
A_BEO_CR1             000002BF R     02     DS$ATTACH             000101A8
A_BEO_CR2             000002BB R     02     DS$BGNSUB             00010030
A_BEO_DB              000002AF R     02     DS$BRANCH             000100A8
A_BE3_CC              000002C3 R     02     DS$BREAK              00010058
A_BE3_CR1             000002C7 R     02     DS$CANWAIT            00010070
A_BUFFERS_1           000000EB R     02     DS$CHANNEL            00010180
A_BUFFERS_2           000000FB R     02     DS$CKLOOP             00010040
A_BUFRS_DFR_1         000000CB R     02     DS$CLRVEC             00010168
A_BUFRS_DFR_2         000000DB R     02     DS$CNTRLC             00010078
A_MAP_BGN           = 00F26800              DS$CVTREG             000100B0
A_MAP_END           = 00F26FFC              DS$ENDPASS            00010010
A_MEM_CSR_1         = 00F20004              DS$ENDSUB             00010038
A_SIMUL_GO          = 00FFF00C              DS$ERRDEV             000100C8
A_UBE_ADR_TBL         000002AB R     02     DS$ERRHARD            000100D0
A_UBE_BUFFER_0        ********    X  02     DS$ERRPREP            00010108
A_UBE_BUFFER_1        ********    X  02     DS$ERRSOFT            000100D8
A_UBE_BUFFER_2        ********    X  02     DS$ERRSYS             000100C0
A_UBE_BUFFER_3        ********    X  02     DS$ESCAPE             00010050
A_UBI_CSR           = 00F26010              DS$FREEDBGSYM         000101B8
A_UB_IO_SP          = 00FC0000              DS$GETBUF             00010120
BASE_008              00000000 R     04     DS$GETMEM             00010130
BASE_009              00000000 R     07     DS$GPHARD             00010018
BEO_SERVICE           00001A74 R     02     DS$HELP               000101B0
BEO_UNIT_NO           ********    X  04     DS$INITSCB            00010170
BE1_UNIT_NO           ********    X  07     DS$INLOOP             00010048
BE3_SERVICE           00001A7C R     02     DS$K_BNERROR          ********    X  04
BIT...              = 0000001A              DS$K_ERROR          = 00000002
BR_SERVICE            00001A3C R     02     DS$K_NORMAL         = 00000001
B_DONE_CT             000000A2 R     02     DS$K_SEVERE         = 00000004
B_MAPS_REQ_1          000000BF R     02     DS$K_SUBSYS         = 00000066
B_MAPS_REQ_2          000000C3 R     02     DS$K_WARNING        = 00000000
CEP_FUNCTIONAL      = 00000000              DS$LOAD               00010198
CEP_REPAIR          = 00000001              DS$LOADPCS            000101C0
CHANNEL_ERR           000016CC R     02     DS$MAPDBGBLOCK        00010118
CHC$_CLEAR            ********    X  04     DS$MMOFF              00010158
CHC$_DSINT            ********    X  04     DS$MMON               00010150
CHC$_ENINT            ********    X  04     DS$MOVPHY             00010148
CHECK_BUFFER          000019CA R     02     DS$MOVVRT             00010140
CHECK_BUF_0           00001A00 R     02     DS$PARSE              000100B8
```

```
DS$PRINTB                         000100E0        DSA$GL_APTCOM                   0000FE04
DS$PRINTF                         000100F0        DSA$GL_DEVLEN                   0000FE58
DS$PRINTS                         000100F8        DSA$GL_ERRNO                    0000FE44
DS$PRINTSIG                       00010100        DSA$GL_EVENT                    0000FE48
DS$PRINTX                         000100E8        DSA$GL_FLAGS                    0000FE00
DS$PROBE                          000101A0        DSA$GL_MSGTYP                   0000FE40
DS$RELBUF                         00010128        DSA$GL_PASSES                   0000FE08
DS$RELMEM                         00010138        DSA$GL_PASSNO                   0000FE54
DS$SETIPL                         00010178        DSA$GL_SECTNO                   0000FE10
DS$SETMAP                         00010188        DSA$GL_SID                      0000FE14
DS$SETPRIEXV                      00010110        DSA$GL_SUBTNO                   0000FE4C
DS$SETVEC                         00010160        DSA$GL_TESTNO                   0000FE50
DS$SHOCHAN                        00010190        DSA$GL_UNITS                    0000FE0C
DS$SUMMARY                        00010028        DSA$GQ_MSGPTR                   0000FE68
DS$WAITMS                         00010060        DSA$GT_DEVNAM                   0000FE5C
DS$WAITUS                         00010068        DSA$M_APT                     = 80000000
DS$_ARITH                       = 006600D0        DSA$M_BELL                    = 00000008
DS$_BADLINK                     = 006600F0        DSA$M_BINARY                  = 00000002
DS$_BADTYPE                     = 006600E8        DSA$M_CRD_AUTOTEST            = 00000800
DS$_CHME                        = 006600A8        DSA$M_CRD_MENUTEST            = 00010000
DS$_CHMK                        = 006600E0        DSA$M_CRD_TRACE               = 00020000
DS$_DEVNAME                     = 00660108        DSA$M_DEBUG                   = 04000000
DS$_ERROR                       = 00660002        DSA$M_HALT                    = 00000001
DS$_FHWE                        = 00660068        DSA$M_IE1                     = 00000010
DS$_FRAGBUF                     = 00660080        DSA$M_IE2                     = 00000020
DS$_ICBUSY                      = 006600C8        DSA$M_IE3                     = 00000040
DS$_ICERR                       = 006600C0        DSA$M_IES                     = 00000080
DS$_IHWE                        = 00660060        DSA$M_LOAD_DEBUGGER           = 40000000
DS$_ILLCHAR                     = 00660018        DSA$M_LOOP                    = 00000004
DS$_ILLPAGCNT                   = 00660078        DSA$M_NORPT                   = 08000000
DS$_ILLUNIT                     = 00660100        DSA$M_OPER                    = 00001000
DS$_INSFMEM                     = 00660050        DSA$M_PASS0                   = 20000000
DS$_IPL2HI                      = 006600B8        DSA$M_PROMPT                  = 00002000
DS$_IVADDR                      = 00660040        DSA$M_QA                      = 00008000
DS$_IVVECT                      = 00660038        DSA$M_QUICK                   = 00000100
DS$_KRNLSTK                     = 00660090        DSA$M_SEARCH                  = 00004000
DS$_LOGIC                       = 00660070        DSA$M_TRACE                   = 00000400
DS$_MCHK                        = 00660088        DSA$M_USER                    = 10000000
DS$_MMOFF                       = 00660058        DSA$M_VERIFY                  = 00000200
DS$_NEEDUNIT                    = 006600F8        DSA$V_APT                     = 0000001F
DS$_NOPCS                       = 00660110        DSA$V_BELL                    = 00000003
DS$_NORMAL                      = 00660001        DSA$V_BINARY                  = 00000001
DS$_NOSUPPORT                   = 006600B1        DSA$V_CRD_AUTOTEST            = 0000000B
DS$_NOTDON                      = 00660030        DSA$V_CRD_MENUTEST            = 00000010
DS$_NOTIMP                      = 006600B0        DSA$V_CRD_TRACE               = 00000011
DS$_NULLSTR                     = 00660010        DSA$V_DEBUG                   = 0000001A
DS$_OVERFLOW                    = 00660008        DSA$V_HALT                    = 00000000
DS$_POWER                       = 00660098        DSA$V_IE1                     = 00000004
DS$_PROGERR                     = 00660020        DSA$V_IE2                     = 00000005
DS$_SEVERE                      = 00660004        DSA$V_IE3                     = 00000006
DS$_TRANSL                      = 006600A0        DSA$V_IES                     = 00000007
DS$_TRUNCATE                    = 00660028        DSA$V_LOAD_DEBUGGER           = 0000001E
DS$_UNEXPINT                    = 006600D8        DSA$V_LOOP                    = 00000002
DS$_VASFULL                     = 00660048        DSA$V_NORPT                   = 0000001B
DS$_WARNING                     = 00660000        DSA$V_OPER                    = 0000000C
DSA$AL_APTMAIL                    0000FE00        DSA$V_PASS0                   = 0000001D
DSA$AT_APTTXT                     0000FA00        DSA$V_PROMPT                  = 0000000D
```

```
DSA$V_QA                      = 0000000F                 KA$L_SID                        0000003A
DSA$V_QUICK                   = 00000008                 KA$M_CHAR                     = 00000100
DSA$V_SEARCH                  = 0000000E                 KA$M_CRC                      = 00000010
DSA$V_TRACE                   = 0000000A                 KA$M_D_FLOAT                  = 00000002
DSA$V_USER                    = 0000001C                 KA$M_EDIT                     = 00000080
DSA$V_VERIFY                  = 00000009                 KA$M_F_FLOAT                  = 00000001
ENV$M_DOMAIN                  = 00000002                 KA$M_G_FLOAT                  = 00000004
ENV$M_LEVEL                   = 00000001                 KA$M_H_FLOAT                  = 00000008
ENV$M_SUPER                   = 000003FC                 KA$M_PACKED                   = 00000020
ENV$S_DOMAIN                  = 00000001                 KA$M_PACK_MUL                 = 00000040
ENV$S_LEVEL                   = 00000001                 KA$M_SB_ERR                   = 02000000
ENV$S_SUPER                   = 00000008                 KA$M_TODR                     = 00010000
ENV$V_DOMAIN                  = 00000001                 KA$M_WCS_LD                   = 01000000
ENV$V_LEVEL                   = 00000000                 KA$V_CHAR                     = 00000008
ENV$V_SUPER                   = 00000002                 KA$V_CRC                      = 00000004
ENV$_CPU                      = 00000000                 KA$V_D_FLOAT                  = 00000001
ENV$_FUNCTIONAL               = 00000000                 KA$V_EDIT                     = 00000007
ENV$_REPAIR                   = 00000001                 KA$V_F_FLOAT                  = 00000000
ENV$_SUPER                    = 00000001                 KA$V_G_FLOAT                  = 00000002
ENV$_SYSTEM                   = 00000001                 KA$V_H_FLOAT                  = 00000003
ERR$_MSGADR                   = 0000000C                 KA$V_PACKED                   = 00000005
ERR$_NARGS                    = 0000000A                 KA$V_PACK_MUL                 = 00000006
ERR$_NUM                      = 00000004                 KA$V_SB_ERR                   = 00000019
ERR$_P1                       = 00000014                 KA$V_TODR                     = 00000010
ERR$_P2                       = 00000018                 KA$V_WCS_LD                   = 00000018
ERR$_P3                       = 0000001C                 KA$W_LATENCY                    0000003E
ERR$_P4                       = 00000020                 KA$W_MEM_SIZE                   00000044
ERR$_P5                       = 00000024                 KA$W_PROGRESS                   00000040
ERR$_P6                       = 00000028                 KA$W_RESERVED                   00000038
ERR$_POINTER                  = 00000010                 KA$W_WCS                        00000036
ERR$_UNIT                     = 00000008                 LDPCTX                        = 0000000B   G
FRST_VAL_MAP                    00000002 R      02       LOAD_BUFFER                     000019B5 R      02
HALT                          = 00000004   G             L_BR_LVL                        000000AB R      02
HP$A_DEPENDENT                  00000032                 L_BUFFER_ADR                    000000C7 R      02
HP$A_DEVICE                     00000018                 L_BUFFER_SIZE                   0000010B R      02
HP$A_DVA                        0000001C                 L_BUF_SIZES_1                   0000010F R      02
HP$A_LINK                       00000020                 L_BUF_SIZES_2                   0000011F R      02
HP$B_DRIVE                      0000000B                 L_ERROR_CT                      0000015F R      02
HP$B_FLAGS                      0000000A                 L_ERROR_LOG                     00000163 R      02
HP$M_ALLOC                    = 00000001                 L_EXP_DATA                      0000005E R      02
HP$M_WASALL                   = 00000002                 L_INFO_BIT                      0000018B R      02
HP$Q_DEVICE                     00000000                 L_INITL_MAP                     0000014F R      02
HP$T_DEVICE                     0000000C                 L_IPL                           000000A7 R      02
HP$T_TYPE                       00000026                 L_LAST_UBE                      ********     X  07
HP$V_ALLOC                    = 00000000                 L_MAPS_NEEDED                   000000A3 R      02
HP$V_WASALL                   = 00000001                 L_MAP_NUM                       0000008A R      02
HP$W_SIZE                       00000008                 L_MXFR_TIME                     000000BB R      02
HP$W_VECTOR                     00000024                 L_NXM_ADR                       00000086 R      02
INTR_ERR                        0000166E R      02       L_PAGE_NO                       0000004A R      02
INTR_SERVICE                    00001A6C R      02       L_PAIR_SEP                      0000018F R      02
INVAL_MAPS                      000018FB R      02       L_PATTERN                     = 33550FFF
IPR                           = 00000006   G             L_POP                           0000019F R      02
KA$B_ACC_TYPE                   00000042                 L_POSITION                      00000193 R      02
KA$B_RESERVED                   00000043                 L_PTRN                          0000008E R      02
KA$B_SID_TYPE                   0000003D                 L_PTRNS                         00000092 R      02
KA$K_LEN                        00000046                 L_RETRIEVE                      000001A3 R      02
KA$L_FLAGS                      00000032                 L_SAVE_CSR                      0000004E R      02
```

```
L_TEMP_A                        00000197 R      02    M_PWR_DN                      = 00000010
L_TEMP_B                        0000019B R      02    M_RDY                         = 00000080
L_UBI_STATUS                    000000AF R      02    M_RLS_BUS                     = 00000C00
L_XFR_COUNT                     000000B7 R      02    M_RUN                         = 00000001
MANUAL                        = 00000001  G           M_TIMEOUT                     = 00000004
MAP_ADR_ERR                     000013E9 R      02    M_TM_DLY                      = 00004000
MAP_ENT_TBL                     000001A7 R      02    M_TRANSFER                    = 00000010
MCHK                          = 00000005  G           M_TWO_XFR                     = 00000800
MEM                           = 00000009  G           M_UBI_NON_STS                 = 7FFE3FFF
MSG_008                         00000002 R      04    M_UBI_NXM_ERR                 = 00010000
MSG_009                         00000002 R      07    M_UBI_PB_ERR                  = 00008000
MXFR_ERR                        0000154A R      02    M_UBI_RDS_ERR                 = 80000000
M_BR4                         = 00000002              M_UBI_STS                     = 8001C000
M_BR5                         = 00000004              M_UBI_WR_ERR                  = 00004000
M_BR6                         = 00000008              M_UNX_SSYN_ERR                = 00000040
M_BR7                         = 00000010              M_WNG_A                       = 00000200
M_BR_INTR                     = 00000008              M_WNG_GNT                     = 00000020
M_BYTE_OFF                    = 02000000              NO_ACCESS                       0000171B R      02
M_CCOVF                       = 00002000              PAR$M_ATDEF                   = 00000010
M_CC_DAT                      = 00001000              PAR$M_ATHI                    = 00000008
M_CLK_ERR                     = 80000000              PAR$M_ATLO                    = 00000004
M_CLK_INTR                    = 00000080              PAR$M_NODEF                   = 00000002
M_DATA_ERR                    = 00001000              PAR$V_ATDEF                   = 00000004
M_DATI                        = 00000000              PAR$V_ATHI                    = 00000003
M_DATIP                       = 00000100              PAR$V_ATLO                    = 00000002
M_DATO                        = 00000200              PAR$V_NODEF                   = 00000001
M_DATOB                       = 00000300              PAR$_BIN                      = 00000002
M_DATOB_IP                    = 00004000              PAR$_DEC                      = 0000000A
M_DIAG_MODE                   = 04000000              PAR$_HEX                      = 00000010
M_DSABL_ECC                   = 02000000              PAR$_NO                       = 00000000
M_ENABLE                      = 00000040              PAR$_OCT                      = 00000008
M_ENB_PB                      = 00001000              PAR$_YES                      = 00000001
M_ERR                         = 00008000              POWER                         = 00000003  G
M_EXP_BR_INTR                 = 00000002              PR$L_UB_INIT                  = 00000037
M_EXP_NXM_ERR                 = 00000200              PR$_ICCS                        ********   X    02
M_EXP_PB_ERR                  = 00000400              PR$_MCESR                       ********   X    02
M_EXP_WR_ERR                  = 00000080              PR$_NICR                        ********   X    07
M_EXT_MEM                     = 00000000              PSL$C_EXEC                    = 00000001
M_FRCE_TB_ERR                 = 20000000              PSL$C_KERNEL                  = 00000000
M_GO                          = 00000001              PSL$C_SUPER                   = 00000002
M_INH_INC                     = 00000004              PSL$C_USER                    = 00000003
M_INH_ROL                     = 00002000              PSL$K_EXEC                    = 00000001
M_INH_SACK                    = 00000008              PSL$K_KERNEL                  = 00000000
M_INTR_ERR                    = 00000010              PSL$K_SUPER                   = 00000002
M_INT_BM                      = 00000000              PSL$K_USER                    = 00000003
M_INT_ODNE                    = 00000040              PSL$M_C                       = 00000001
M_INT_SSYN                    = 00000800              PSL$M_CBIT                    = 00000001
M_MAP_NOWRT                   = 7DFF8000              PSL$M_CM                      = 80000000
M_MAP_VAL                     = 80000000              PSL$M_CURMOD                  = 03000000
M_MAP_WRTBL                   = 82007FFF              PSL$M_DV                      = 00000080
M_MAX_LAT                     = 00000040              PSL$M_FPD                     = 08000000
M_NO_CSR                      = 00000001              PSL$M_FU                      = 00000040
M_NO_GNT                      = 00000400              PSL$M_IPL                     = 001F0000
M_NO_SACK                     = 00000080              PSL$M_IS                      = 04000000
M_NO_SSYN                     = 00000100              PSL$M_IV                      = 00000020
M_NPR                         = 00000020              PSL$M_N                       = 00000008
M_ONE_XFR                     = 00000400              PSL$M_NBIT                    = 00000008
```

```
PSL$M_PRVMOD                  = 00C00000               SCB$L_SFTLVL12                  000000B0
PSL$M_SAFBITS                 = 000037FF               SCB$L_SFTLVL13                  000000B4
PSL$M_TBIT                    = 00000010               SCB$L_SFTLVL14                  000000B8
PSL$M_TP                      = 40000000               SCB$L_SFTLVL15                  000000BC
PSL$M_V                       = 00000002               SCB$L_SFTLVL2                   00000088
PSL$M_VBIT                    = 00000002               SCB$L_SFTLVL3                   0000008C
PSL$M_Z                       = 00000004               SCB$L_SFTLVL4                   00000090
PSL$M_ZBIT                    = 00000004               SCB$L_SFTLVL5                   00000094
PSL$S_CURMOD                  = 00000002               SCB$L_SFTLVL6                   00000098
PSL$S_IPL                     = 00000005               SCB$L_SFTLVL7                   0000009C
PSL$S_PRVMOD                  = 00000002               SCB$L_SFTLVL8                   000000A0
PSL$V_C                       = 00000000               SCB$L_SFTLVL9                   000000A4
PSL$V_CBIT                    = 00000000               SCB$L_TBIT                      00000028
PSL$V_CM                      = 0000001F               SCB$L_TIMER                     000000C0
PSL$V_CURMOD                  = 00000018               SCB$L_TRANSL                    00000024
PSL$V_DV                      = 00000007               SCB$L_TXDB                      000000FC
PSL$V_FPD                     = 0000001B               SCB$L_ZERO                      00000000
PSL$V_FU                      = 00000006               SEP_FUNCTIONAL                = 00000002
PSL$V_IPL                     = 00000010               SEP_REPAIR                    = 00000003
PSL$V_IS                      = 0000001A               SET_UP_MAPS                     0000194D R      02
PSL$V_IV                      = 00000005               SIZ...                        = 00000001
PSL$V_N                       = 00000003               SYS$ALLOC                       00010238
PSL$V_NBIT                    = 00000003               SYS$ASCTIM                      00010248
PSL$V_PRVMOD                  = 00000016               SYS$ASSIGN                      00010250
PSL$V_TBIT                    = 00000004               SYS$BINTIM                      00010258
PSL$V_TP                      = 0000001E               SYS$CANCEL                      00010260
PSL$V_V                       = 00000001               SYS$CANTIM                      00010268
PSL$V_VBIT                    = 00000001               SYS$CLOSE                       000105B8
PSL$V_Z                       = 00000002               SYS$CLREF                       00010298
PSL$V_ZBIT                    = 00000002               SYS$CONNECT                     000105C0
RD_MLLR_DECODE                  0000175E R      02     SYS$DALLOC                      000102D8
RD_MLLR_ENCODE                  0000172F R      02     SYS$DASSGN                      000102E0
RD_MLLR_TBL                     00000237 R      02     SYS$DISCONNECT                  000105D0
RETRIEVE_TBL                    00000257 R      02     SYS$FAO                         00010350
SCB$L_ACCESS                    00000020               SYS$FAOL                        00010358
SCB$L_ARITH                     00000034               SYS$GET                         00010580
SCB$L_BE0                     = 00000348               SYS$GETCHN                      000104C8
SCB$L_BE1                     = 0000034C               SYS$GETTIM                      00010378
SCB$L_BE2                     = 00000350               SYS$LKWSET                      000103A0
SCB$L_BE3                     = 00000354               SYS$NUMTIM                      000103B8
SCB$L_BREAK                     0000002C               SYS$OPEN                        00010608
SCB$L_CHME                      00000044               SYS$QIO                         000103C8
SCB$L_CHMK                      00000040               SYS$QIOW                        00010200
SCB$L_CHMS                      00000048               SYS$READ                        00010590
SCB$L_CHMU                      0000004C               SYS$READEF                      000103D0
SCB$L_COMPAT                    00000030               SYS$SETAST                      000103F8
SCB$L_KNLSTK                    00000008               SYS$SETEF                       00010400
SCB$L_MACHCHK                   00000004               SYS$SETIMR                      00010420
SCB$L_OPCCUS                    00000014               SYS$SETPRI                      00010428
SCB$L_OPCDEC                    00000010               SYS$SETPRT                      00010430
SCB$L_POWER                     0000000C               SYS$SETRWM                      00010438
SCB$L_RADRMOD                   0000001C               SYS$SETSWM                      00010448
SCB$L_ROPRAND                   00000018               SYS$ULKPAG                      00010460
SCB$L_RXDB                      000000F8               SYS$ULWSET                      00010468
SCB$L_SFTLVL1                   00000084               SYS$UNWIND                      00010470
SCB$L_SFTLVL10                  000000A8               SYS$WAITFR                      00010478
SCB$L_SFTLVL11                  000000AC               SYS$WFLAND                      00010488
```

```
SYS$WFLOR                        00010490                  T_AO_DATIP_ERR                    000006EC R     02
T8_S1                            0000003C RG     04        T_AO_DATI_ERR                     000006B3 R     02
T8_S10                           00000A61 RG     04        T_AO_DATOB_ERR                    00000679 R     02
T8_S10_X                         00000B76 R      04        T_AO_DATO_ERR                     00000640 R     02
T8_S11                           00000B81 RG     04        T_BUFF_ADR                        00000953 R     02
T8_S11_X                         00000C9A R      04        T_BYTE_ERR                        00000D72 R     02
T8_S12                           00000CA5 RG     04        T_CHANNEL_ERR                     000012FF R     02
T8_S12_X                         00000E3B R      04        T_CSR_ERR                         00000463 R     02
T8_S13                           00000E46 RG     04        T_CSR_NCL_ERR                     0000114D R     02
T8_S13_X                         00000F69 R      04        T_DATA_REG_ERR                    00000540 R     02
T8_S14                           00000F74 RG     04        T_DATIP_ERR                       000005D3 R     02
T8_S14_X                         00001085 R      04        T_DATI_ERR                        0000056C R     02
T8_S15                           00001090 RG     04        T_DATOB_ERR                       000005FB R     02
T8_S15_X                         000011A7 R      04        T_DATO_ERR                        0000061E R     02
T8_S16                           000011B2 RG     04        T_D_ERR_HDR                       000008B5 R     02
T8_S16_X                         0000132B R      04        T_D_PATH_ERR                      0000058E R     02
T8_S17                           00001336 RG     04        T_EXP_INTR                        00001174 R     02
T8_S17_X                         0000147F R      04        T_IHWE                            0000133C R     02
T8_S18                           0000148A RG     04        T_INTR_ERR                        000007DF R     02
T8_S18_X                         000015D0 R      04        T_INT_SSYN_ERR                    00000F9E R     02
T8_S19                           000015DB RG     04        T_IVVECT                          00001393 R     02
T8_S19_X                         000016D6 R      04        T_LOGIC                           00001360 R     02
T8_S1_X                          0000012F R      04        T_LONG_ERR                        00000DC8 R     02
T8_S2                            0000013A RG     04        T_M1_UBE_0                        0000096B R     02
T8_S20                           000016E1 RG     04        T_M1_UBE_1                        000009F4 R     02
T8_S20_X                         000017DD R      04        T_M1_UBE_2                        00000A62 R     02
T8_S21                           000017E8 RG     04        T_M1_UBE_3                        00000AA5 R     02
T8_S21_X                         000018D5 R      04        T_M2_UBE_0                        00000AE8 R     02
T8_S22                           000018E0 RG     04        T_M2_UBE_1                        00000B4C R     02
T8_S22_X                         0000198A R      04        T_M2_UBE_2                        00000BAD R     02
T8_S2_X                          000001A6 R      04        T_M2_UBE_3                        00000C1E R     02
T8_S3                            000001B1 RG     04        T_MAPS_USED                       00000C9F R     02
T8_S3_X                          00000244 R      04        T_MAP_ABUS_ERR                    000004AC R     02
T8_S4                            0000024F RG     04        T_MAP_ADR_ERR                     00001236 R     02
T8_S4_X                          00000332 R      04        T_MAP_DBUS_ERR                    00000482 R     02
T8_S5                            0000033D RG     04        T_MAP_ENT_ERR                     000004D9 R     02
T8_S5_X                          0000049E R      04        T_MAP_FCN_ERR                     0000075A R     02
T8_S6                            000004A9 RG     04        T_MAP_INV_ERR                     0000080D R     02
T8_S6_X                          00000652 R      04        T_MAP_SEL_ERR                     000005B0 R     02
T8_S7                            0000065D RG     04        T_MAP_USED                        00000CC7 R     02
T8_S7_X                          000007D9 R      04        T_MAX_LAT_ERR                     00000E6D R     02
T8_S8                            000007E4 RG     04        T_MULTI_ERR                       0000083A R     02
T8_S8_X                          0000091F R      04        T_MXFR_1_DESC                     0000012F R     02
T8_S9                            0000092A RG     04        T_MXFR_2_DESC                     0000013F R     02
T8_S9_X                          00000A56 R      04        T_MXFR_D_ERR                      00000866 R     02
T9_S1                            000000C0 RG     07        T_MXFR_ERR_HDR                    00000CE7 R     02
T9_S1_X                          000003A3 R      07        T_MXFR_TYPE                       00000939 R     02
T9_S2                            000003AE RG     07        T_NO_ACCESS                       000003C3 R     02
T9_S2_X                          00000620 R      07        T_NO_BEO                          00000397 R     02
TEST_008                         00000020 RG     04        T_NO_CSR_ERR                      00000888 R     02
TEST_008_X                       00001998 RG     04        T_NO_GNT_ERR                      00000F50 R     02
TEST_009                         00000020 RG     07        T_NO_INTR                         000011DF R     02
TEST_009_X                       0000066F RG     07        T_NO_MAPS                         00000437 R     02
TIMER_SERVICE                    00001AA4 R      02        T_NO_NXM_ERR                      00001052 R     02
TU58                           = 00000002  G               T_NO_PB_ERR                       000010A7 R     02
T_ACTL_INTR                      00001204 R      02        T_NO_RDY_ERR                      00000E0D R     02
T_ADR_REG_ERR                    00000511 R      02        T_NO_SACK_ERR                     00000EA4 R     02
```

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T_NO_SSYN_ERR                      00000ECA R       02
T_NO_UBE                           00000414 R       02
T_NO_WR_ERR                        00001117 R       02
T_NXM_ERR                          000007B6 R       02
T_PB_ERR                           00000786 R       02
T_PG_BND_WR_ERR                    0000072B R       02
T_UBE_ADR                          000003E5 R       02
T_UBI_NXM_ERR                      0000101E R       02
T_UBI_PB_ERR                       00001081 R       02
T_UBI_RDS_ERR                      00000FEA R       02
T_UBI_WR_ERR                       000010DF R       02
T_UNXP_INTR                        000011B4 R       02
T_UNX_SSYN_ERR                     00000DE4 R       02
T_WNG_A_ERR                        00000F02 R       02
T_WNG_GNT_ERR                      00000E40 R       02
T_WORD_ERR                         00000DA0 R       02
UBE_0_MULT_1                       00000337 R       02
UBE_0_MULT_2                       00000367 R       02
UBE_1_MULT_1                       00000343 R       02
UBE_1_MULT_2                       00000373 R       02
UBE_2_MULT_1                       0000034F R       02
UBE_2_MULT_2                       0000037F R       02
UBE_3_MULT_1                       0000035B R       02
UBE_3_MULT_2                       0000038B R       02
UBE_BR4_INTR                       0000032B R       02
UBE_BR5_INTR                       0000031F R       02
UBE_BR6_INTR                       00000313 R       02
UBE_BR7_INTR                       00000307 R       02
UBE_DATIP_1                        000002D7 R       02
UBE_DATI_T                         000002CB R       02
UBE_DATOB_1                        000002E3 R       02
UBE_DATO_T                         000002EF R       02
UBE_PB_ERR                         000002FB R       02
UBE_SET_UP                         00001850 R       02
UBI                              = 0000000A   G
UNIBUS_SIZER                       00001867 R       02
VAL_MAPS                           0000190D R       02
V_BR_INTR                        = 00000003
V_BYTE_OFF                       = 00000019
V_CCOVF                          = 0000000D
V_CLK_ERR                        = 0000001F
V_CLK_INTR                       = 00000007
V_DATA_ERR                       = 0000000C
V_ENABLE                         = 00000006
V_ERR                            = 0000000F
V_EXP_BR_INTR                    = 00000001
V_EXP_NXM_ERR                    = 00000009
V_EXP_PB_ERR                     = 0000000A
V_EXP_WR_ERR                     = 00000007
V_INTR_ERR                       = 00000004
V_INT_SSYN                       = 0000000B
V_MAP_VAL                        = 0000001F
V_MAX_LAT                        = 00000006
V_NO_CSR                         = 00000000
V_NO_GNT                         = 0000000A
V_NO_SACK                        = 00000007
V_NO_SSYN                        = 00000008
V_RDY                            = 00000007
V_RUN                            = 00000000
V_TIMEOUT                        = 00000002
V_TRANSFER                       = 00000004
V_UBI_NXM_ERR                    = 00000010
V_UBI_PB_ERR                     = 0000000F
V_UBI_RDS_ERR                    = 0000001F
V_UBI_WR_ERR                     = 0000000E
V_UNX_SSYN_ERR                   = 00000006
V_VALID_MAPS                       00000006 R       02
V_WNG_A                          = 00000009
V_WNG_GNT                        = 00000005
WCS                              = 00000007   G
W_FLAGS                            00000000 R       02
W_PTRN_TBL                         0000029F R       02
W_UBI_STS_2                        000000B3 R       02
W_VECTOR                           000000B5 R       02
XFER_ERR                           00001420 R       02
```

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                                          +----------------+
                                          ! Psect synopsis !
                                          +----------------+
PSECT name                Allocation          PSECT No.  Attributes
----------                ----------          ---------  ----------
.  ABS  .                 00000000  (      0.)  00 (   0.)  NOPIC     USR    CON    ABS    LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
. BLANK .                 00000000  (      0.)  01 (   1.)  NOPIC     USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
ENKAXH                    00001AB5  (   6837.)  02 (   2.)  NOPIC     USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
$ABS$                     00010610  (67088.)  03 (   3.)  NOPIC     USR    CON    ABS    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
TEST_008                  000019BF  (   6591.)  04 (   4.)  NOPIC     USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
DISPATCH                  00000030  (     48.)  05 (   5.)  NOPIC     USR    CON    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
ARGLIST                   00000120  (    288.)  06 (   6.)  NOPIC     USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC LONG
TEST_009                  00000677  (   1655.)  07 (   7.)  NOPIC     USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
$TSTCNT                   00000004  (      4.)  08 (   8.)  NOPIC     USR    OVR    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
```

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                                       +--------------------------+
                                       ! Symbol Cross Reference !
                                       +--------------------------+
SYMBOL                        VALUE        DEFINITION       REFERENCES...
------                        -----        ----------       -------------
$$$                           =00000114-R  3985    (34)     1479   (9)       1561   (10)      1679   (12)      1759   (13)
                                                            1887   (14)      2008   (15)      2124   (16)      2240   (17)
                                                            2347   (18)      2450   (19)      2554   (20)      2654   (21)
                                                            2779   (22)      2881   (23)      2979   (24)      3078   (25)
                                                            3205   (26)      3315   (27)      3414   (28)      3499   (29)
                                                            3581   (30)      3654   (31)      3807   (33)      3985   (34)
$$ARGS                        =0000000A    81      (2)      81     (2)
$$E                           =00000001    3985    (34)     1530   (9)       1586   (10)      1719   (12)      1815   (13)
                                                            1974   (14)      2083   (15)      2203   (16)      2309   (17)
                                                            2419   (18)      2517   (19)      2621   (20)      2746   (21)
                                                            2848   (22)      2946   (23)      3045   (24)      3163   (25)
                                                            3272   (26)      3382   (27)      3465   (28)      3549   (29)
                                                            3626   (30)      3693   (31)      3940   (33)      4102   (34)
$$M                           =00000006    4091    (34)     1428   (8)       1494   (9)       1509   (9)       1526   (9)
                                                            1579   (10)      1715   (12)      1776   (13)      1793   (13)
                                                            1809   (13)      1903   (14)      1921   (14)      1943   (14)
                                                            1966   (14)      2017   (15)      2027   (15)      2042   (15)
                                                            2054   (15)      2071   (15)      2133   (16)      2166   (16)
                                                            2194   (16)      2268   (17)      2296   (17)      2376   (18)
                                                            2405   (18)      2475   (19)      2502   (19)      2580   (20)
                                                            2607   (20)      2686   (21)      2714   (21)      2731   (21)
                                                            2805   (22)      2834   (22)      2904   (23)      2931   (23)
                                                            3003   (24)      3030   (24)      3103   (25)      3131   (25)
                                                            3148   (25)      3233   (26)      3261   (26)      3343   (27)
                                                            3371   (27)      3444   (28)      3463   (28)      3513   (29)
                                                            3547   (29)      3605   (30)      3624   (30)      3674   (31)
                                                            3690   (31)      3722   (32)      3827   (33)      3899   (33)
                                                            3910   (33)      3929   (33)      4051   (34)      4072   (34)
                                                            4091   (34)
$$N                           =00000001    4091    (34)   #-1005   (6)     #-1010   (6)       1016   (6)       1030   (6)
                                                          #-1432   (8)       1494   (9)       1509   (9)       1526   (9)
                                                            1579   (10)      1715   (12)      1776   (13)      1793   (13)
                                                            1809   (13)      1903   (14)      1921   (14)      1943   (14)
                                                            1966   (14)      2017   (15)      2027   (15)      2042   (15)
                                                            2054   (15)      2071   (15)      2133   (16)    #-2150   (16)
                                                            2166   (16)      2194   (16)      2268   (17)      2296   (17)
                                                            2376   (18)      2405   (18)      2475   (19)      2502   (19)
                                                            2580   (20)      2607   (20)      2686   (21)      2714   (21)
                                                            2731   (21)      2805   (22)      2834   (22)      2904   (23)
                                                            2931   (23)      3003   (24)      3030   (24)      3103   (25)
                                                            3131   (25)      3148   (25)      3233   (26)      3261   (26)
                                                            3343   (27)      3371   (27)      3444   (28)      3463   (28)
                                                            3513   (29)      3547   (29)      3605   (30)      3624   (30)
                                                            3674   (31)      3690   (31)    #-3729   (32)      3827   (33)
                                                            3899   (33)      3910   (33)      3929   (33)      4051   (34)
                                                            4072   (34)      4091   (34)    #-774    (6)       782    (6)
                                                            805    (6)     #-821    (6)       827    (6)       833    (6)
                                                          #-847    (6)       85     (2)     #-850    (6)     #-853    (6)
                                                          #-856    (6)     #-859    (6)     #-862    (6)     #-865    (6)
                                                          #-868    (6)     #-871    (6)     #-874    (6)     #-877    (6)
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                                                                #-880  (6)      #-896  (6)      #-898  (6)        901  (6)
                                                                  904  (6)      #-905  (6)        914  (6)        922  (6)
                                                                #-939  (6)      #-944  (6)      #-949  (6)      #-954  (6)
                                                                #-957  (6)      #-961  (6)        977  (6)        981  (6)
                                                                #-985  (6)        991  (6)
$$S                                 =FFFFFFFF     4110  (34)     1417  (8)       1428  (8)       1439  (9)       1479  (9)
                                                                 1534  (10)      1561  (10)      1591  (12)      1679  (12)
                                                                 1723  (13)      1759  (13)      1819  (14)      1887  (14)
                                                                 1978  (15)      2008  (15)      2087  (16)      2124  (16)
                                                                 2207  (17)      2240  (17)      2313  (18)      2347  (18)
                                                                 2423  (19)      2450  (19)      2521  (20)      2554  (20)
                                                                 2625  (21)      2654  (21)      2750  (22)      2779  (22)
                                                                 2852  (23)      2881  (23)      2950  (24)      2979  (24)
                                                                 3049  (25)      3078  (25)      3167  (26)      3205  (26)
                                                                 3276  (27)      3315  (27)      3386  (28)      3414  (28)
                                                                 3469  (29)      3499  (29)      3553  (30)      3581  (30)
                                                                 3630  (31)      3654  (31)      3704  (32)      3722  (32)
                                                                 3757  (33)      3807  (33)      3944  (34)      3985  (34)
$$T1                                =0000002C     81    (2)      81    (2)
$ENV                                =00000001     64    (2)
$ER                                 =FFFFFFFF     4110  (34)     1479  (9)      #-1489  (9)     #-1494  (9)     #-1509  (9)
                                                               #-1526  (9)       1561  (10)    #-1579  (10)      1679  (12)
                                                               #-1715  (12)      1759  (13)    #-1776  (13)    #-1793  (13)
                                                               #-1809  (13)      1887  (14)    #-1898  (14)    #-1903  (14)
                                                               #-1921  (14)    #-1943  (14)    #-1966  (14)      2008  (15)
                                                               #-2014  (15)    #-2017  (15)    #-2024  (15)    #-2027  (15)
                                                               #-2042  (15)    #-2054  (15)    #-2071  (15)      2124  (16)
                                                               #-2130  (16)    #-2133  (16)    #-2166  (16)    #-2194  (16)
                                                                 2240  (17)    #-2268  (17)    #-2296  (17)      2347  (18)
                                                               #-2376  (18)    #-2405  (18)      2450  (19)    #-2475  (19)
                                                               #-2502  (19)      2554  (20)    #-2580  (20)    #-2607  (20)
                                                                 2654  (21)    #-2686  (21)    #-2714  (21)    #-2731  (21)
                                                                 2779  (22)    #-2805  (22)    #-2834  (22)      2881  (23)
                                                               #-2904  (23)    #-2931  (23)      2979  (24)    #-3003  (24)
                                                               #-3030  (24)      3078  (25)    #-3103  (25)    #-3131  (25)
                                                               #-3148  (25)      3205  (26)    #-3233  (26)    #-3261  (26)
                                                                 3315  (27)    #-3343  (27)    #-3371  (27)      3414  (28)
                                                               #-3444  (28)    #-3463  (28)      3499  (29)    #-3513  (29)
                                                               #-3547  (29)      3581  (30)    #-3605  (30)    #-3624  (30)
                                                                 3654  (31)    #-3674  (31)    #-3690  (31)      3807  (33)
                                                               #-3822  (33)    #-3827  (33)    #-3899  (33)    #-3910  (33)
                                                               #-3929  (33)      3985  (34)    #-4051  (34)    #-4072  (34)
                                                               #-4091  (34)
$MO                                 =00000001     4112  (34)     4112  (34)
$S$                                 =00000114-R   3985  (34)     1479  (9)       1530  (9)       1561  (10)      1586  (10)
                                                                 1679  (12)      1719  (12)      1759  (13)      1815  (13)
                                                                 1887  (14)      1974  (14)      2008  (15)      2083  (15)
                                                                 2124  (16)      2203  (16)      2240  (17)      2309  (17)
                                                                 2347  (18)      2419  (18)      2450  (19)      2517  (19)
                                                                 2554  (20)      2621  (20)      2654  (21)      2746  (21)
                                                                 2779  (22)      2848  (22)      2881  (23)      2946  (23)
                                                                 2979  (24)      3045  (24)      3078  (25)      3163  (25)
                                                                 3205  (26)      3272  (26)      3315  (27)      3382  (27)
                                                                 3414  (28)      3465  (28)      3499  (29)      3549  (29)
                                                                 3581  (30)      3626  (30)      3654  (31)      3693  (31)
                                                                 3807  (33)      3940  (33)      3985  (34)      4102  (34)
$ST                                 =00000000     4110  (34)     1428  (8)       1439  (9)       1479  (9)       1494  (9)
```

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                                                          1509   (9)      1511   (9)      1526   (9)      1528   (9)
                                                          1530   (9)      1534   (10)     1561   (10)     1579   (10)
                                                          1581   (10)     1586   (10)     1591   (12)     1679   (12)
                                                          1715   (12)     1719   (12)     1723   (13)     1759   (13)
                                                          1776   (13)     1778   (13)     1793   (13)     1795   (13)
                                                          1809   (13)     1811   (13)     1815   (13)     1819   (14)
                                                          1887   (14)     1903   (14)     1921   (14)     1923   (14)
                                                          1943   (14)     1945   (14)     1966   (14)     1968   (14)
                                                          1974   (14)     1978   (15)     2008   (15)     2017   (15)
                                                          2027   (15)     2042   (15)     2054   (15)     2071   (15)
                                                          2083   (15)     2087   (16)     2124   (16)     2133   (16)
                                                          2166   (16)     2194   (16)     2197   (16)     2203   (16)
                                                          2207   (17)     2240   (17)     2268   (17)     2296   (17)
                                                          2299   (17)     2309   (17)     2313   (18)     2347   (18)
                                                          2376   (18)     2405   (18)     2408   (18)     2419   (18)
                                                          2423   (19)     2450   (19)     2475   (19)     2502   (19)
                                                          2505   (19)     2517   (19)     2521   (20)     2554   (20)
                                                          2580   (20)     2607   (20)     2610   (20)     2621   (20)
                                                          2625   (21)     2654   (21)     2686   (21)     2714   (21)
                                                          2731   (21)     2734   (21)     2746   (21)     2750   (22)
                                                          2779   (22)     2805   (22)     2834   (22)     2837   (22)
                                                          2848   (22)     2852   (23)     2881   (23)     2904   (23)
                                                          2931   (23)     2934   (23)     2946   (23)     2950   (24)
                                                          2979   (24)     3003   (24)     3030   (24)     3033   (24)
                                                          3045   (24)     3049   (25)     3078   (25)     3103   (25)
                                                          3131   (25)     3148   (25)     3151   (25)     3163   (25)
                                                          3167   (26)     3205   (26)     3233   (26)     3261   (26)
                                                          3264   (26)     3272   (26)     3276   (27)     3315   (27)
                                                          3343   (27)     3371   (27)     3374   (27)     3382   (27)
                                                          3386   (28)     3414   (28)     3444   (28)     3463   (28)
                                                          3465   (28)     3469   (29)     3499   (29)     3513   (29)
                                                          3547   (29)     3549   (29)     3553   (30)     3581   (30)
                                                          3605   (30)     3624   (30)     3626   (30)     3630   (31)
                                                          3654   (31)     3674   (31)     3690   (31)     3693   (31)
                                                          3695   (31)     3722   (32)     3757   (33)     3807   (33)
                                                          3827   (33)     3899   (33)     3910   (33)     3929   (33)
                                                          3940   (33)     3944   (34)     3985   (34)     4051   (34)
                                                          4072   (34)     4091   (34)     4102   (34)     4110   (34)
$TN                              =00000009   4112   (34)  1417   (8)      1428   (8)      1433   (8)      1439   (9)
                                                          1494   (9)      1509   (9)      1526   (9)      1534   (10)
                                                          1579   (10)     1591   (12)     1715   (12)     1723   (13)
                                                          1776   (13)     1793   (13)     1809   (13)     1819   (14)
                                                          1903   (14)     1905   (14)     1921   (14)     1943   (14)
                                                          1966   (14)     1978   (15)     2017   (15)     2027   (15)
                                                          2042   (15)     2054   (15)     2071   (15)     2087   (16)
                                                          2133   (16)     2151   (16)     2166   (16)     2194   (16)
                                                          2207   (17)     2268   (17)     2296   (17)     2313   (18)
                                                          2376   (18)     2405   (18)     2423   (19)     2475   (19)
                                                          2502   (19)     2521   (20)     2580   (20)     2607   (20)
                                                          2625   (21)     2686   (21)     2714   (21)     2731   (21)
                                                          2750   (22)     2805   (22)     2834   (22)     2852   (23)
                                                          2904   (23)     2931   (23)     2950   (24)     3003   (24)
                                                          3030   (24)     3049   (25)     3103   (25)     3131   (25)
                                                          3148   (25)     3167   (26)     3233   (26)     3261   (26)
                                                          3276   (27)     3343   (27)     3371   (27)     3386   (28)
                                                          3444   (28)     3463   (28)     3469   (29)     3513   (29)
                                                          3547   (29)     3553   (30)     3605   (30)     3624   (30)
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                                                        3630    (31)      3674    (31)      3690    (31)      3695    (31)
                                                        3704    (32)      3722    (32)      3730    (32)      3757    (33)
                                                        3827    (33)      3828    (33)      3899    (33)      3910    (33)
                                                        3929    (33)      3944    (34)      4051    (34)      4072    (34)
                                                        4091    (34)      4110    (34)      4112    (34)
ALL                        =00000008     85     (2)     1428    (8)       3722    (32)
ALL_MAPS                    0000192A-R   1227   (7)     2143    (16)
A_BEO_BA                    000002B7-R   384    (2)   #-1910    (14)    #-1911    (14)    #-1914    (14)    #-1921    (14)
A_BEO_CC                    000002B3-R   383    (2)
A_BEO_CLR_ERR               000002AB-R   381    (2)
A_BEO_CR1                   000002BF-R   386    (2)   #-1138    (7)       2039    (15)      2162    (16)      2183    (16)
                                                        2263    (17)      2287    (17)      2371    (18)      2396    (18)
                                                        2470    (19)      2493    (19)      2575    (20)      2598    (20)
                                                        2681    (21)      2705    (21)      2800    (22)      2825    (22)
                                                        2899    (23)      2922    (23)      2998    (24)      3021    (24)
                                                        3098    (25)      3122    (25)      3228    (26)      3252    (26)
                                                        3338    (27)      3362    (27)      3439    (28)      3508    (29)
                                                        3600    (30)      3669    (31)      846     (6)
A_BEO_CR2                   000002BB-R   385    (2)     3457    (28)      3541    (29)      3618    (30)      3686    (31)
                                                        849     (6)       852     (6)       855     (6)       858     (6)
                                                        861     (6)       864     (6)       867     (6)       956     (6)
A_BEO_DB                    000002AF-R   382    (2)     1896    (14)    #-1932    (14)    #-1933    (14)    #-1936    (14)
                                                      #-1943    (14)    #-1953    (14)    #-2178    (16)    #-2180    (16)
                                                      #-2194    (16)    #-2280    (17)    #-2283    (17)    #-2296    (17)
                                                      #-2389    (18)    #-2392    (18)    #-2405    (18)    #-2698    (21)
                                                      #-2701    (21)    #-2714    (21)    #-2818    (22)    #-2821    (22)
                                                      #-2834    (22)    #-3115    (25)    #-3118    (25)    #-3131    (25)
                                                      #-3245    (26)    #-3248    (26)    #-3261    (26)    #-3355    (27)
                                                      #-3358    (27)    #-3371    (27)    #-3817    (33)    #-4082    (34)
                                                        4084    (34)
A_BE3_CC                    000002C3-R   387    (2)   #-1396    (7)
A_BE3_CR1                   000002C7-R   388    (2)   #-1397    (7)
A_BUFFERS_1                 000000EB-R   257    (2)   #-3751    (32)    #-3839    (33)    #-3848    (33)    #-3891    (33)
                                                      #-3899    (33)    #-3910    (33)    #-3921    (33)    #-3929    (33)
A_BUFFERS_2                 000000FB-R   258    (2)   #-4001    (34)    #-4041    (34)    #-4051    (34)    #-4064    (34)
                                                      #-4072    (34)    #-4091    (34)
A_BUFRS_DFR_1               000000CB-R   249    (2)   #-3750    (32)
A_BUFRS_DFR_2               000000DB-R   253    (2)
A_MAP_BGN                  =00F26800     212    (2)   #-1208    (7)     #-1219    (7)     #-1232    (7)     #-1262    (7)
                                                      #-1264    (7)     #-1265    (7)     #-1568    (10)    #-1569    (10)
                                                      #-1579    (10)    #-1686    (12)    #-1697    (12)    #-1765    (13)
                                                      #-2258    (17)    #-2259    (17)    #-2301    (17)    #-2357    (18)
                                                      #-2358    (18)    #-2664    (21)    #-2665    (21)    #-2789    (22)
                                                      #-3223    (26)    #-3224    (26)    #-3266    (26)    #-3333    (27)
                                                      #-3334    (27)    #-3376    (27)    #-3424    (28)    #-3425    (28)
                                                      #-3426    (28)    #-3428    (28)    #-3523    (29)    #-3595    (30)
                                                      #-3596    (30)    #-3662    (31)    #-798     (6)     #-831     (6)
                                                      #-920     (6)
A_MAP_END                  =00F26FFC     213    (2)   #-1813    (13)
A_MEM_CSR_1                =00F20004     292    (2)   #-3519    (29)    #-3524    (29)
A_SIMUL_GO                 =00FFF00C     215    (2)   #-3873    (33)    #-4032    (34)
A_UBE_ADR_TBL               000002AB-R   380    (2)     1135    (7)
A_UBE_BUFFER_0              00000000-XR               #-2139    (16)    #-2140    (16)    #-2245    (17)    #-2246    (17)
                                                      #-2351    (18)    #-2454    (19)    #-2455    (19)      249     (2)
                                                        250     (2)       253     (2)     #-2558    (20)    #-2559    (20)
                                                      #-2658    (21)    #-2659    (21)    #-2783    (22)    #-2784    (22)
                                                      #-2885    (23)    #-2983    (24)    #-2984    (24)    #-3082    (25)
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                                                           #-3083   (25)  #-3210   (26)    3211   (26)  #-3217   (26)
                                                           #-3221   (26)    3320   (27)  #-3321   (27)  #-3331   (27)
                                                           #-3419   (28)    3424   (28)  #-3503   (29)    3520   (29)
                                                           #-3584   (30)  #-3656   (31)  #-3664   (31)    3843   (33)
A_UBE_BUFFER_1                   00000000-XR                  254   (2)   #-3433   (28)
A_UBE_BUFFER_2                   00000000-XR                  251   (2)      255   (2)
A_UBE_BUFFER_3                   00000000-XR                  252   (2)      256   (2)
A_UBI_CSR                       =00F26010    211     (2)     1487   (9)   #-1498   (9)   #-1499   (9)   #-1509   (9)
                                                           #-1515   (9)   #-1516   (9)   #-1526   (9)   #-2164   (16)
                                                           #-2177   (16)  #-2265   (17)  #-2279   (17)  #-2373   (18)
                                                           #-2388   (18)  #-2472   (19)  #-2486   (19)  #-2577   (20)
                                                           #-2591   (20)  #-2683   (21)  #-2697   (21)  #-2802   (22)
                                                           #-2817   (22)  #-2901   (23)  #-2915   (23)  #-3000   (24)
                                                           #-3014   (24)  #-3100   (25)  #-3114   (25)  #-3230   (26)
                                                           #-3244   (26)  #-3340   (27)  #-3354   (27)  #-3441   (28)
                                                           #-3455   (28)  #-3458   (28)  #-3510   (29)  #-3539   (29)
                                                           #-3542   (29)  #-3602   (30)  #-3616   (30)  #-3619   (30)
                                                           #-3671   (31)  #-3685   (31)  #-959    (6)
A_UB_IO_SP                      =00FC0000    214     (2)   #-1165   (7)
BASE_008                         00000000-R  1417    (8)     1428   (8)
BASE_009                         00000000-R  3704    (32)    3722   (32)
BEO_SERVICE                      00001A74-R  1379    (7)     3738   (32)     3739   (32)     3740   (32)     3741   (32)
BEO_UNIT_NO                      00000000-XR               #-1430   (8)   #-1487   (9)   #-1494   (9)   #-1509   (9)
                                                           #-1526   (9)   #-1579   (10)  #-1715   (12)  #-1776   (13)
                                                           #-1793   (13)  #-1809   (13)  #-1896   (14)  #-1903   (14)
                                                           #-1921   (14)  #-1943   (14)  #-1966   (14)  #-2013   (15)
                                                           #-2017   (15)  #-2023   (15)  #-2027   (15)  #-2042   (15)
                                                           #-2054   (15)  #-2071   (15)  #-2129   (16)  #-2133   (16)
                                                           #-2194   (16)  #-2268   (17)  #-2296   (17)  #-2376   (18)
                                                           #-2405   (18)  #-2475   (19)  #-2502   (19)  #-2580   (20)
                                                           #-2607   (20)  #-2686   (21)  #-2714   (21)  #-2731   (21)
                                                           #-2805   (22)  #-2834   (22)  #-2904   (23)  #-2931   (23)
                                                           #-3003   (24)  #-3030   (24)  #-3103   (25)  #-3131   (25)
                                                           #-3148   (25)  #-3233   (26)  #-3261   (26)  #-3343   (27)
                                                           #-3371   (27)  #-3444   (28)  #-3463   (28)  #-3513   (29)
                                                           #-3547   (29)  #-3605   (30)  #-3624   (30)  #-3674   (31)
                                                           #-3690   (31)  #-3700   (31)  #-3820   (33)  #-3827   (33)
                                                           #-3899   (33)  #-3929   (33)  #-4051   (34)  #-4072   (34)
                                                           #-4091   (34)
BE1_UNIT_NO                      00000000-XR               #-3910   (33)
BE3_SERVICE                      00001A7C-R  1391    (7)     3987   (34)
BIT...                          =0000001A    84      (2)     64     (2)      77     (2)      78     (2)      79     (2)
                                                             80     (2)      83     (2)      84     (2)
BR_SERVICE                       00001A3C-R  1348    (7)     2013   (15)     2023   (15)     3700   (31)
B_DONE_CT                        000000A2-R  237     (2)   #-1381   (7)   #-1399   (7)   #-3836   (33)  #-3876   (33)
                                                           #-3994   (34)  #-4035   (34)
B_MAPS_REQ_1                     000000BF-R  246     (2)   #-3849   (33)
B_MAPS_REQ_2                     000000C3-R  247     (2)   #-4002   (34)
CEP_FUNCTIONAL                  =00000000    64      (2)
CEP_REPAIR                      =00000001    64      (2)     64     (2)
CHANNEL_ERR                      000016CC-R  999     (6)     2017   (15)     2027   (15)     2133   (16)
CHC$_CLEAR                       00000000-XR               #-2013   (15)
CHC$_DSINT                       00000000-XR               #-3700   (31)
CHC$_ENINT                       00000000-XR               #-2023   (15)  #-2129   (16)
CHECK_BUFFER                     000019CA-R  1297    (7)     3892   (33)     3903   (33)     3922   (33)     4065   (34)
CHECK_BUF_0                      00001A00-R  1322    (7)     4044   (34)
CHI$V_IPL                        00000000-XR               #-1355   (7)   #-988    (6)
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CODEVECTORS                     00000297-R   360    (2)    #-1051    (7)   #-1103    (7)
CPU$V_COMET                    =00000002     77     (2)
CPU$V_HS                       =00000000     77     (2)
CPU$V_STAR                     =00000001     77     (2)
CSR_CHK                         00001471-R   843    (6)      835     (6)     924     (6)
CSR_ERR                         000015DF-R   934    (6)      1494    (9)     3463    (28)    3547    (29)    3624    (30)
                                                             3690    (31)
DATA_008                        0000001C-R   1428   (8)      1428    (8)
DATA_009                        0000001C-R   3722   (32)     3722    (32)
DATA_ERR                        000013C0-R   770    (6)      1509    (9)     1526    (9)     1579    (10)    1776    (13)
                                                             1793    (13)    1809    (13)    1921    (14)    1943    (14)
                                                             1966    (14)
DECODE_TBL                      00000277-R   354    (2)    #-1070    (7)   #-1095    (7)   #-1101    (7)   #-1113    (7)
                                                           #-1709    (12)   #-805    (6)
DEFAULT                        =00000000     85     (2)      1428    (8)     3722    (32)
DS$ABORT                        00010020     82     (2)
DS$ASKADR                       00010090     82     (2)
DS$ASKDATA                      00010080     82     (2)
DS$ASKLGCL                      00010098     82     (2)
DS$ASKSTR                       000100A0     82     (2)
DS$ASKVLD                       00010088     82     (2)
DS$ATTACH                       000101A8     82     (2)
DS$BGNSUB                       00010030     82     (2)      1479    (9)     1561    (10)    1679    (12)    1759    (13)
                                                             1887    (14)    2008    (15)    2124    (16)    2240    (17)
                                                             2347    (18)    2450    (19)    2554    (20)    2654    (21)
                                                             2779    (22)    2881    (23)    2979    (24)    3078    (25)
                                                             3205    (26)    3315    (27)    3414    (28)    3499    (29)
                                                             3581    (30)    3654    (31)    3807    (33)    3985    (34)
DS$BRANCH                       000100A8     82     (2)      1489    (9)     1898    (14)    2014    (15)    2024    (15)
                                                             2130    (16)    3822    (33)
DS$BREAK                        00010058     82     (2)      1175    (7)     3695    (31)    3834    (33)    4000    (34)
                                                             4110    (34)
DS$CANWAIT                      00010070     82     (2)      1350    (7)     1370    (7)
DS$CHANNEL                      00010180     82     (2)      2013    (15)    2023    (15)    2129    (16)    3700    (31)
DS$CKLOOP                       00010040     82     (2)      1511    (9)     1528    (9)     1581    (10)    1778    (13)
                                                             1795    (13)    1811    (13)    1923    (14)    1945    (14)
                                                             1968    (14)    2197    (16)    2299    (17)    2408    (18)
                                                             2505    (19)    2610    (20)    2734    (21)    2837    (22)
                                                             2934    (23)    3033    (24)    3151    (25)    3264    (26)
                                                             3374    (27)
DS$CLRVEC                       00010168     82     (2)      1189    (7)     4104    (34)    4105    (34)    4106    (34)
                                                             4107    (34)    4108    (34)
DS$CNTRLC                       00010078     82     (2)
DS$CVTREG                       000100B0     82     (2)
DS$ENDPASS                      00010010     82     (2)
DS$ENDSUB                       00010038     82     (2)      1530    (9)     1586    (10)    1719    (12)    1815    (13)
                                                             1974    (14)    2083    (15)    2203    (16)    2309    (17)
                                                             2419    (18)    2517    (19)    2621    (20)    2746    (21)
                                                             2848    (22)    2946    (23)    3045    (24)    3163    (25)
                                                             3272    (26)    3382    (27)    3465    (28)    3549    (29)
                                                             3626    (30)    3693    (31)    3940    (33)    4102    (34)
DS$ERRDEV                       000100C8     82     (2)
DS$ERRHARD                      000100D0     82     (2)      1494    (9)     1509    (9)     1526    (9)     1579    (10)
                                                             1715    (12)    1776    (13)    1793    (13)    1809    (13)
                                                             1903    (14)    1921    (14)    1943    (14)    1966    (14)
                                                             2017    (15)    2027    (15)    2042    (15)    2054    (15)
                                                             2071    (15)    2133    (16)    2166    (16)    2194    (16)
                                                             2268   (17)     2296   (17)     2376   (18)     2405   (18)
                                                             2475   (19)     2502   (19)     2580   (20)     2607   (20)
                                                             2686   (21)     2714   (21)     2731   (21)     2805   (22)
                                                             2834   (22)     2904   (23)     2931   (23)     3003   (24)
                                                             3030   (24)     3103   (25)     3131   (25)     3148   (25)
                                                             3233   (26)     3261   (26)     3343   (27)     3371   (27)
                                                             3444   (28)     3463   (28)     3513   (29)     3547   (29)
                                                             3605   (30)     3624   (30)     3674   (31)     3690   (31)
                                                             3827   (33)     3899   (33)     3910   (33)     3929   (33)
                                                             4051   (34)     4072   (34)     4091   (34)
DS$ERRPREP                      00010108     82     (2)
DS$ERRSOFT                      000100D8     82     (2)
DS$ERRSYS                       000100C0     82     (2)
DS$ESCAPE                       00010050     82     (2)
DS$FREEDBGSYM                   000101B8     82     (2)
DS$GETBUF                       00010120     82     (2)
DS$GETMEM                       00010130     82     (2)
DS$GPHARD                       00010018     82     (2)
DS$HELP                         000101B0     82     (2)
DS$INITSCB                      00010170     82     (2)
DS$INLOOP                       00010048     82     (2)
DS$K_BNERROR                    00000000-XR                #-1489   (9)    #-1898   (14)   #-2014   (15)   #-2024   (15)
                                                           #-2130   (16)   #-3822   (33)
DS$K_ERROR                      =00000002    78     (2)
DS$K_NORMAL                     =00000001    78     (2)
DS$K_SEVERE                     =00000004    78     (2)
DS$K_SUBSYS                     =00000066    78     (2)      78     (2)
DS$K_WARNING                    =00000000    78     (2)
DS$LOAD                         00010198     82     (2)
DS$LOADPCS                      000101C0     82     (2)
DS$MAPDBGBLOCK                  00010118     82     (2)
DS$MMOFF                        00010158     82     (2)
DS$MMON                         00010150     82     (2)
DS$MOVPHY                       00010148     82     (2)
DS$MOVVRT                       00010140     82     (2)
DS$PARSE                        000100B8     82     (2)
DS$PRINTB                       000100E0     82     (2)      1005   (6)      1010   (6)      1016   (6)      1030   (6)
                                                             2150   (16)     774    (6)      782    (6)      805    (6)
                                                             821    (6)      827    (6)      847    (6)      850    (6)
                                                             853    (6)      856    (6)      859    (6)      862    (6)
                                                             865    (6)      868    (6)      871    (6)      874    (6)
                                                             877    (6)      880    (6)      896    (6)      898    (6)
                                                             901    (6)      904    (6)      939    (6)      944    (6)
                                                             949    (6)      954    (6)      957    (6)      961    (6)
                                                             977    (6)      981    (6)      985    (6)      991    (6)
DS$PRINTF                       000100F0     82     (2)      1432   (8)      3729   (32)
DS$PRINTS                       000100F8     82     (2)
DS$PRINTSIG                     00010100     82     (2)
DS$PRINTX                       000100E8     82     (2)      833    (6)      905    (6)      914    (6)      922    (6)
DS$PROBE                        000101A0     82     (2)      1487   (9)      1896   (14)     3820   (33)
DS$RELBUF                       00010128     82     (2)
DS$RELMEM                       00010138     82     (2)
DS$SETIPL                       00010178     82     (2)      2034   (15)     2062   (15)     2081   (15)
DS$SETMAP                       00010188     82     (2)
DS$SETPRIEXV                    00010110     82     (2)
DS$SETVEC                       00010160     82     (2)      1162   (7)      3738   (32)     3739   (32)     3740   (32)
                                                             3741   (32)     3745   (32)     3987   (34)
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                                                       H  7
ZZ-ENKAX-1.3    Cross reference                    3-AUG-1983          Fiche 3  Frame H7          Sequence 497
ENKAXH                         VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:54:13  VAX-11 Macro V03-00        Page 124
Cross reference                                                          3-AUG-1983 10:02:08  WRKD$0:[PAN.ENKAX]ENKAXH.MAR;76  (34)

DS$SHOCHAN                  00010190     82     (2)
DS$SUMMARY                  00010028     82     (2)
DS$WAITMS                   00010060     82     (2)     2049    (15)      2065    (15)      2173    (16)      2275    (17)
                                                        2384    (18)      2482    (19)      2587    (20)      2693    (21)
                                                        2813    (22)      2911    (23)      3010    (24)      3110    (25)
                                                        3240    (26)      3350    (27)      3451    (28)      3535    (29)
                                                        3612    (30)      3681    (31)
DS$WAITUS                   00010068     82     (2)
DS$_ARITH                  =006600D0     78     (2)
DS$_BADLINK                =006600F0     78     (2)
DS$_BADTYPE                =006600E8     78     (2)
DS$_CHME                   =006600A8     78     (2)
DS$_CHMK                   =006600E0     78     (2)
DS$_DEVNAME                =00660108     78     (2)
DS$_ERROR                  =00660002     78     (2)
DS$_FHWE                   =00660068     78     (2)
DS$_FRAGBUF                =00660080     78     (2)
DS$_ICBUSY                 =006600C8     78     (2)
DS$_ICERR                  =006600C0     78     (2)
DS$_IHWE                   =00660060     78     (2)    #-1003    (6)
DS$_ILLCHAR                =00660018     78     (2)
DS$_ILLPAGCNT              =00660078     78     (2)
DS$_ILLUNIT                =00660100     78     (2)
DS$_INSFMEM                =00660050     78     (2)
DS$_IPL2HI                 =006600B8     78     (2)
DS$_IVADDR                 =00660040     78     (2)
DS$_IVVECT                 =00660038     78     (2)    #-1013    (6)
DS$_KRNLSTK                =00660090     78     (2)
DS$_LOGIC                  =00660070     78     (2)    #-1008    (6)
DS$_MCHK                   =00660088     78     (2)
DS$_MMOFF                  =00660058     78     (2)
DS$_NEEDUNIT               =006600F8     78     (2)
DS$_NOPCS                  =00660110     78     (2)
DS$_NORMAL                 =00660001     78     (2)
DS$_NOSUPPORT              =006600B1     78     (2)
DS$_NOTDON                 =00660030     78     (2)
DS$_NOTIMP                 =006600B0     78     (2)      78      (2)
DS$_NULLSTR                =00660010     78     (2)
DS$_OVERFLOW               =00660008     78     (2)
DS$_POWER                  =00660098     78     (2)
DS$_PROGERR                =00660020     78     (2)
DS$_SEVERE                 =00660004     78     (2)
DS$_TRANSL                 =006600A0     78     (2)
DS$_TRUNCATE               =00660028     78     (2)
DS$_UNEXPINT               =006600D8     78     (2)
DS$_VASFULL                =00660048     78     (2)
DS$_WARNING                =00660000     78     (2)      78      (2)
DSA$AL_APTMAIL              0000FE00     77     (2)
DSA$AT_APTTXT               0000FA00     77     (2)
DSA$GL_APTCOM               0000FE04     77     (2)
DSA$GL_DEVLEN               0000FE58     77     (2)
DSA$GL_ERRNO                0000FE44     77     (2)
DSA$GL_EVENT                0000FE48     77     (2)
DSA$GL_FLAGS                0000FE00     77     (2)     3935    (33)      4096    (34)
DSA$GL_MSGTYP               0000FE40     77     (2)
DSA$GL_PASSES               0000FE08     77     (2)
DSA$GL_PASSNO               0000FE54     77     (2)
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DSA$GL_SECTNO              0000FE10      77     (2)
DSA$GL_SID                 0000FE14      77     (2)
DSA$GL_SUBTNO              0000FE4C      77     (2)
DSA$GL_TESTNO              0000FE50      77     (2)
DSA$GL_UNITS               0000FE0C      77     (2)
DSA$GQ_MSGPTR              0000FE68      77     (2)
DSA$GT_DEVNAM              0000FE5C      77     (2)
DSA$M_APT                 =80000000      77     (2)
DSA$M_BELL                =00000008      77     (2)
DSA$M_BINARY              =00000002      77     (2)
DSA$M_CRD_AUTOTEST        =00000800      77     (2)
DSA$M_CRD_MENUTEST        =00010000      77     (2)
DSA$M_CRD_TRACE           =00020000      77     (2)
DSA$M_DEBUG               =04000000      77     (2)
DSA$M_HALT                =00000001      77     (2)
DSA$M_IE1                 =00000010      77     (2)
DSA$M_IE2                 =00000020      77     (2)
DSA$M_IE3                 =00000040      77     (2)
DSA$M_IES                 =00000080      77     (2)
DSA$M_LOAD_DEBUGGER       =40000000      77     (2)
DSA$M_LOOP                =00000004      77     (2)
DSA$M_NORPT               =08000000      77     (2)
DSA$M_OPER                =00001000      77     (2)
DSA$M_PASSO               =20000000      77     (2)
DSA$M_PROMPT              =00002000      77     (2)
DSA$M_QA                  =00008000      77     (2)
DSA$M_QUICK               =00000100      77     (2)
DSA$M_SEARCH              =00004000      77     (2)
DSA$M_TRACE               =00000400      77     (2)
DSA$M_USER                =10000000      77     (2)
DSA$M_VERIFY              =00000200      77     (2)
DSA$V_APT                 =0000001F      77     (2)
DSA$V_BELL                =00000003      77     (2)
DSA$V_BINARY              =00000001      77     (2)
DSA$V_CRD_AUTOTEST        =0000000B      77     (2)
DSA$V_CRD_MENUTEST        =00000010      77     (2)
DSA$V_CRD_TRACE           =00000011      77     (2)
DSA$V_DEBUG               =0000001A      77     (2)
DSA$V_HALT                =00000000      77     (2)
DSA$V_IE1                 =00000004      77     (2)
DSA$V_IE2                 =00000005      77     (2)
DSA$V_IE3                 =00000006      77     (2)
DSA$V_IES                 =00000007      77     (2)
DSA$V_LOAD_DEBUGGER       =0000001E      77     (2)
DSA$V_LOOP                =00000002      77     (2)
DSA$V_NORPT               =0000001B      77     (2)
DSA$V_OPER                =0000000C      77     (2)
DSA$V_PASSO               =0000001D      77     (2)
DSA$V_PROMPT              =0000000D      77     (2)
DSA$V_QA                  =0000000F      77     (2)
DSA$V_QUICK               =00000008      77     (2)      #-3935    (33)    #-4096    (34)
DSA$V_SEARCH              =0000000E      77     (2)
DSA$V_TRACE               =0000000A      77     (2)
DSA$V_USER                =0000001C      77     (2)
DSA$V_VERIFY              =00000009      77     (2)
ENV$M_DOMAIN              =00000002      64     (2)
ENV$M_LEVEL               =00000001      64     (2)
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ENV$M_SUPER                     =000003FC     64    (2)
ENV$S_DOMAIN                    =00000001     64    (2)
ENV$S_LEVEL                     =00000001     64    (2)
ENV$S_SUPER                     =00000008     64    (2)
ENV$V_DOMAIN                    =00000001     64    (2)      64     (2)
ENV$V_LEVEL                     =00000000     64    (2)      64     (2)
ENV$V_SUPER                     =00000002     64    (2)
ENV$_CPU                        =00000000     64    (2)      64     (2)
ENV$_FUNCTIONAL                 =00000000     64    (2)      64     (2)
ENV$_REPAIR                     =00000001     64    (2)      64     (2)
ENV$_SUPER                      =00000001     64    (2)
ENV$_SYSTEM                     =00000001     64    (2)      64     (2)
ERR$_MSGADR                     =0000000C     81    (2)
ERR$_NARGS                      =0000000A     81    (2)
ERR$_NUM                        =00000004     81    (2)
ERR$_P1                         =00000014     81    (2)    #-1030   (6)      #-782    (6)      #-827    (6)       898    (6)
ERR$_P2                         =00000018     81    (2)    #-776    (6)      #-782    (6)      #-819    (6)      #-827   (6)
                                                           #-901    (6)
ERR$_P3                         =0000001C     81    (2)    #-776    (6)      #-782    (6)      #-819    (6)      #-827   (6)
ERR$_P4                         =00000020     81    (2)     782     (6)       827     (6)
ERR$_P5                         =00000024     81    (2)    #-829    (6)
ERR$_P6                         =00000028     81    (2)
ERR$_POINTER                    =00000010     81    (2)
ERR$_UNIT                       =00000008     81    (2)
FRST_VAL_MAP                     00000002-R   228   (2)    #-1181   (7)      #-1184   (7)      #-2148   (16)     #-2158   (16)
                                                           #-2194   (16)     #-2356   (18)     #-2366   (18)     #-2405   (18)
                                                           #-2464   (19)     #-2502   (19)     #-2571   (20)     #-2607   (20)
                                                           #-2663   (21)     #-2676   (21)     #-2714   (21)     #-2731   (21)
                                                           #-2788   (22)     #-2796   (22)     #-2834   (22)     #-2894   (23)
                                                           #-2931   (23)     #-2994   (24)     #-3030   (24)     #-3094   (25)
                                                           #-3131   (25)     #-3148   (25)     #-3423   (28)     #-3435   (28)
                                                           #-3522   (29)     #-3530   (29)     #-3587   (30)     #-3593   (30)
                                                           #-3661   (31)
HALT                            =00000004     85    (2)
HP$A_DEPENDENT                   00000032     83    (2)      84     (2)
HP$A_DEVICE                      00000018     83    (2)
HP$A_DVA                         0000001C     83    (2)
HP$A_LINK                        00000020     83    (2)
HP$B_DRIVE                       0000000B     83    (2)
HP$B_FLAGS                       0000000A     83    (2)
HP$M_ALLOC                      =00000001     83    (2)
HP$M_WASALL                     =00000002     83    (2)
HP$Q_DEVICE                      00000000     83    (2)
HP$T_DEVICE                      0000000C     83    (2)
HP$T_TYPE                        00000026     83    (2)
HP$V_ALLOC                      =00000000     83    (2)
HP$V_WASALL                     =00000001     83    (2)
HP$W_SIZE                        00000008     83    (2)
HP$W_VECTOR                      00000024     83    (2)
INTR_ERR                         0000166E-R   970   (6)     2054    (15)      2071    (15)
INTR_SERVICE                     00001A6C-R   1368  (7)     2129    (16)
INVAL_MAPS                       000018FB-R   1205  (7)     2244    (17)      2355    (18)      3209    (26)      3319   (27)
IPR                             =00000006     85    (2)
KA$B_ACC_TYPE                    00000042     84    (2)
KA$B_RESERVED                    00000043     84    (2)
KA$B_SID_TYPE                    0000003D     84    (2)
KA$K_LEN                         00000046     84    (2)
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KA$L_FLAGS                      00000032      84      (2)
KA$L_SID                        0000003A      84      (2)
KA$M_CHAR                      =00000100      84      (2)
KA$M_CRC                       =00000010      84      (2)
KA$M_D_FLOAT                   =00000002      84      (2)
KA$M_EDIT                      =00000080      84      (2)
KA$M_F_FLOAT                   =00000001      84      (2)
KA$M_G_FLOAT                   =00000004      84      (2)
KA$M_H_FLOAT                   =00000008      84      (2)
KA$M_PACKED                    =00000020      84      (2)
KA$M_PACK_MUL                  =00000040      84      (2)
KA$M_SB_ERR                    =02000000      84      (2)
KA$M_TODR                      =00010000      84      (2)
KA$M_WCS_LD                    =01000000      84      (2)
KA$V_CHAR                      =00000008      84      (2)
KA$V_CRC                       =00000004      84      (2)
KA$V_D_FLOAT                   =00000001      84      (2)
KA$V_EDIT                      =00000007      84      (2)
KA$V_F_FLOAT                   =00000000      84      (2)
KA$V_G_FLOAT                   =00000002      84      (2)
KA$V_H_FLOAT                   =00000003      84      (2)
KA$V_PACKED                    =00000005      84      (2)
KA$V_PACK_MUL                  =00000006      84      (2)
KA$V_SB_ERR                    =00000019      84      (2)
KA$V_TODR                      =00000010      84      (2)
KA$V_WCS_LD                    =00000018      84      (2)
KA$W_LATENCY                    0000003E      84      (2)
KA$W_MEM_SIZE                   00000044      84      (2)
KA$W_PROGRESS                   00000040      84      (2)
KA$W_RESERVED                   00000038      84      (2)
KA$W_WCS                        00000036      84      (2)
LDPCTX                         =0000000B      85      (2)
LOAD_BUFFER                     000019B5-R    1280    (7)     3842     (33)     4015     (34)
L_BR_LVL                        000000AB-R    240     (2)   #-1355     (7)    #-2032     (15)   #-2077     (15)   #-2078     (15)
                                                            #-977      (6)
L_BUFFER_ADR                    000000C7-R    248     (2)     1252     (7)    #-1284     (7)    #-1301     (7)      1305     (7)
                                                            #-1327     (7)      1331     (7)    #-3839     (33)   #-3848     (33)
                                                            #-3891     (33)   #-3901     (33)   #-3921     (33)   #-4001     (34)
                                                            #-4041     (34)   #-4064     (34)
L_BUFFER_SIZE                   0000010B-R    259     (2)   #-1285     (7)    #-1308     (7)    #-1335     (7)    #-3838     (33)
                                                            #-3890     (33)   #-3919     (33)   #-4014     (34)   #-4042     (34)
                                                            #-4063     (34)
L_BUF_SIZES_1                   0000010F-R    260     (2)   #-3838     (33)   #-3890     (33)   #-3901     (33)   #-3919     (33)
L_BUF_SIZES_2                   0000011F-R    264     (2)   #-4014     (34)   #-4042     (34)   #-4063     (34)
L_ERROR_CT                      0000015F-R    278     (2)   #-1309     (7)    #-1336     (7)    #-4085     (34)   #-904      (6)
                                                            #-917      (6)
L_ERROR_LOG                     00000163-R    279     (2)   #-1305     (7)    #-1331     (7)    #-4084     (34)   #-907      (6)
                                                            #-914      (6)
L_EXP_DATA                      0000005E-R    232     (2)   #-1301     (7)    #-1306     (7)    #-1332     (7)    #-2460     (19)
                                                            #-2462     (19)   #-2487     (19)   #-2502     (19)   #-2561     (20)
                                                            #-2566     (20)   #-2592     (20)   #-2607     (20)   #-2671     (21)
                                                              2672     (21)   #-2673     (21)   #-2698     (21)   #-2714     (21)
                                                            #-2720     (21)   #-2731     (21)   #-2890     (23)   #-2892     (23)
                                                            #-2916     (23)   #-2931     (23)   #-2990     (24)   #-2992     (24)
                                                            #-3015     (24)   #-3030     (24)   #-3089     (25)     3090     (25)
                                                            #-3091     (25)   #-3115     (25)   #-3131     (25)   #-3137     (25)
                                                            #-3148     (25)   #-3885     (33)     3886     (33)     3887     (33)
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                                                       3888    (33)    3889    (33)  #-3902    (33)  #-3920    (33)
                                                     #-4060    (34)    4061    (34)    4062    (34)  #-4081    (34)
                                                     #-4082    (34)  #-909     (6)   #-914     (6)
L_INFO_BIT                   0000018B-R  281   (2)   #-1075    (7)   #-1077    (7)   #-1086    (7)   #-1096    (7)
L_INITL_MAP                  0000014F-R  277   (2)   #-1261    (7)   #-3859    (33)  #-4004    (34)  #-919     (6)
L_IPL                        000000A7-R  239   (2)   #-2033    (15)  #-2034    (15)  #-2061    (15)  #-2062    (15)
                                                     #-977     (6)   #-981     (6)
L_LAST_UBE                   00000000-XR             #-3727    (32)  #-3830    (33)  #-3861    (33)  #-3876    (33)
                                                     #-3916    (33)  #-3931    (33)  #-4018    (34)  #-4035    (34)
                                                     #-4057    (34)  #-4078    (34)
L_MAPS_NEEDED                000000A3-R  238   (2)   #-1256    (7)   #-1267    (7)   #-3849    (33)  #-4002    (34)
L_MAP_NUM                    0000008A-R  234   (2)   #-1251    (7)   #-1268    (7)   #-3810    (33)  #-3936    (33)
                                                     #-3990    (34)  #-4097    (34)
L_MXFR_TIME                  000000BB-R  245   (2)   #-3867    (33)  #-4026    (34)
L_NXM_ADR                    00000086-R  233   (2)   #-3592    (30)    3594    (30)
L_PAGE_NO                    0000004A-R  230   (2)   #-1229    (7)   #-1252    (7)   #-1262    (7)   #-1263    (7)
                                                     #-2142    (16)  #-2247    (17)  #-2258    (17)  #-2357    (18)
                                                     #-2664    (21)  #-3211    (26)  #-3223    (26)  #-3320    (27)
                                                     #-3333    (27)  #-3520    (29)  #-3521    (29)  #-3523    (29)
                                                     #-3594    (30)  #-3595    (30)  #-3843    (33)
L_PAIR_SEP                   0000018F-R  282   (2)   #-1074    (7)   #-1079    (7)   #-1082    (7)   #-1091    (7)
L_PATTERN                   =33550FFF    291   (2)   #-3811    (33)  #-3991    (34)
L_POP                        0000019F-R  286   (2)   #-1076    (7)   #-1085    (7)   #-1093    (7)   #-1106    (7)
                                                     #-1109    (7)   #-1111    (7)
L_POSITION                   00000193-R  283   (2)   #-1080    (7)   #-1081    (7)   #-1082    (7)   #-1083    (7)
                                                     #-1087    (7)   #-1091    (7)   #-1092    (7)
L_PTRN                       0000008E-R  235   (2)   #-3811    (33)  #-3840    (33)  #-3841    (33)  #-3855    (33)
                                                     #-3856    (33)  #-3991    (34)  #-4007    (34)  #-4008    (34)
L_PTRNS                      00000092-R  236   (2)   #-1283    (7)   #-3841    (33)  #-3856    (33)  #-3857    (33)
                                                     #-3885    (33)  #-3902    (33)  #-3920    (33)  #-4008    (34)
                                                     #-4011    (34)  #-4060    (34)  #-4081    (34)
L_RETRIEVE                   000001A3-R  287   (2)   #-1071    (7)     1072    (7)   #-1073    (7)     1081    (7)
                                                       1083    (7)   #-1104    (7)     1108    (7)
L_SAVE_CSR                   0000004E-R  231   (2)   #-2164    (16)  #-2177    (16)  #-2184    (16)  #-2265    (17)
                                                     #-2279    (17)  #-2285    (17)  #-2373    (18)  #-2388    (18)
                                                     #-2394    (18)  #-2472    (19)  #-2486    (19)  #-2491    (19)
                                                     #-2577    (20)  #-2591    (20)  #-2596    (20)  #-2683    (21)
                                                     #-2697    (21)  #-2703    (21)  #-2802    (22)  #-2817    (22)
                                                     #-2823    (22)  #-2901    (23)  #-2915    (23)  #-2920    (23)
                                                     #-3000    (24)  #-3014    (24)  #-3019    (24)  #-3100    (25)
                                                     #-3114    (25)  #-3120    (25)  #-3230    (26)  #-3244    (26)
                                                     #-3250    (26)  #-3340    (27)  #-3354    (27)  #-3360    (27)
                                                     #-3441    (28)  #-3455    (28)    3456    (28)  #-3510    (29)
                                                     #-3539    (29)    3540    (29)  #-3602    (30)  #-3616    (30)
                                                       3617    (30)  #-3671    (31)  #-3685    (31)     870    (6)
                                                        873    (6)      876    (6)      879    (6)      943    (6)
                                                        948    (6)      953    (6)
L_TEMP_A                     00000197-R  284   (2)   #-1081    (7)   #-1084    (7)   #-1085    (7)   #-1102    (7)
                                                     #-1103    (7)   #-1104    (7)
L_TEMP_B                     0000019B-R  285   (2)   #-1083    (7)   #-1084    (7)   #-1101    (7)     1102    (7)
L_UBI_STATUS                 000000AF-R  241   (2)   #-1003    (6)   #-1008    (6)   #-1013    (6)     2013    (15)
                                                       2023    (15)    2129    (16)    3700    (31)
L_XFR_COUNT                  000000B7-R  244   (2)   #-1393    (7)   #-1394    (7)   #-3992    (34)
MANUAL                      =00000001    85    (2)
MAP_ADR_ERR                  000013E9-R  792   (6)     1715    (12)
MAP_ENT_TBL                  000001A7-R  303   (2)     1567    (10)
MCHK                        =00000005    85    (2)
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MEM                         =00000009    85    (2)
MSG_008                      00000002-R  1417  (8)      1428   (8)
MSG_009                      00000002-R  3704  (32)     3722   (32)
MXFR_ERR                     0000154A-R  892   (6)      3899   (33)     3910   (33)     3929   (33)     4051   (34)
                                                        4072   (34)     4091   (34)
M_BR4                       =00000002    156   (2)       453   (2)
M_BR5                       =00000004    157   (2)       446   (2)       481   (2)       502   (2)
M_BR6                       =00000008    158   (2)       439   (2)       460   (2)       488   (2)
M_BR7                       =00000010    159   (2)    #-1397   (7)       397   (2)       404   (2)       411   (2)
                                                         418   (2)       425   (2)       432   (2)       467   (2)
                                                         474   (2)       495   (2)       509   (2)
M_BR_INTR                   =00000008    122   (2)    #-1351   (7)
M_BYTE_OFF                  =02000000    95    (2)    #-1055   (7)    #-1265   (7)    #-2789   (22)   #-3334   (27)
                                                      #-3426   (28)
M_CCOVF                     =00002000    199   (2)
M_CC_DAT                    =00001000    172   (2)       488   (2)
M_CLK_ERR                   =80000000    110   (2)    #-1410   (7)    #-3866   (33)   #-3871   (33)   #-3878   (33)
                                                      #-4025   (34)   #-4030   (34)   #-4037   (34)
M_CLK_INTR                  =00000080    108   (2)    #-1410   (7)    #-3866   (33)   #-3878   (33)   #-4025   (34)
                                                      #-4037   (34)
M_DATA_ERR                  =00001000    134   (2)    #-2181   (16)   #-2282   (17)   #-2391   (18)   #-2489   (19)
                                                      #-2594   (20)   #-2700   (21)   #-2722   (21)   #-2820   (22)
                                                      #-2918   (23)   #-3017   (24)   #-3117   (25)   #-3140   (25)
                                                      #-3247   (26)   #-3357   (27)
M_DATI                      =00000000    164   (2)    #-1397   (7)       397   (2)       502   (2)       509   (2)
M_DATIP                     =00000100    165   (2)       404   (2)       460   (2)       467   (2)       495   (2)
M_DATO                      =00000200    166   (2)       418   (2)       425   (2)       474   (2)       481   (2)
M_DATOB                     =00000300    167   (2)       411   (2)       488   (2)
M_DATOB_IP                  =00004000    174   (2)       460   (2)
M_DIAG_MODE                 =04000000    100   (2)
M_DSABL_ECC                 =02000000    99    (2)
M_ENABLE                    =00000040    106   (2)    #-3871   (33)   #-4030   (34)
M_ENB_PB                    =00001000    198   (2)       424   (2)
M_ERR                       =00008000    175   (2)
M_EXP_BR_INTR               =00000002    118   (2)    #-2064   (15)
M_EXP_NXM_ERR               =00000200    130   (2)    #-3586   (30)
M_EXP_PB_ERR                =00000400    132   (2)    #-3504   (29)
M_EXP_WR_ERR                =00000080    128   (2)    #-3417   (28)
M_EXT_MEM                   =00000000    180   (2)
M_FRCE_TB_ERR               =20000000    101   (2)    #-3519   (29)   #-3524   (29)
M_GO                        =00000001    155   (2)    #-1397   (7)       397   (2)       404   (2)       411   (2)
                                                         418   (2)       425   (2)       432   (2)       439   (2)
                                                         446   (2)       453   (2)
M_INH_INC                   =00000004    181   (2)
M_INH_ROL                   =00002000    173   (2)       467   (2)
M_INH_SACK                  =00000008    182   (2)
M_INTR_ERR                  =00000010    124   (2)    #-1354   (7)    #-1357   (7)
M_INT_BM                    =00000000    168   (2)       432   (2)       439   (2)       446   (2)       453   (2)
M_INT_ODNE                  =00000040    161   (2)    #-1397   (7)       397   (2)       404   (2)       411   (2)
                                                         418   (2)       425   (2)       460   (2)       467   (2)
                                                         474   (2)       481   (2)       488   (2)       495   (2)
                                                         502   (2)       509   (2)
M_INT_SSYN                  =00000800    196   (2)
M_MAP_NOWRT                 =7DFF8000    94    (2)    #-1569   (10)   #-1697   (12)   #-1767   (13)   #-1783   (13)
                                                      #-1800   (13)
M_MAP_VAL                   =80000000    97    (2)    #-1219   (7)    #-1229   (7)    #-1264   (7)    #-2259   (17)
                                                      #-2358   (18)   #-2665   (21)   #-3224   (26)   #-3334   (27)
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                                                        #-3425    (28)     #-3521    (29)     #-3596    (30)
M_MAP_WRTBL                    =82007FFF      93   (2)  #-1782    (13)     #-1784    (13)     #-1793    (13)
M_MAX_LAT                      =00000040     186   (2)
M_NO_CSR                       =00000001     116   (2)  #-1491    (9)
M_NO_GNT                       =00000400     194   (2)
M_NO_SACK                      =00000080     188   (2)
M_NO_SSYN                      =00000100     190   (2)
M_NPR                          =00000020     160   (2)     397    (2)         404    (2)         411    (2)         418    (2)
                                                           425    (2)         467    (2)         474    (2)         488    (2)
                                                           495    (2)
M_ONE_XFR                      =00000400     169   (2)  #-1397    (7)         397    (2)         404    (2)         411    (2)
                                                           418    (2)         460    (2)         467    (2)         474    (2)
                                                           481    (2)         495    (2)         509    (2)
M_PWR_DN                       =00000010     183   (2)
M_RDY                          =00000080     162   (2)  #-1397    (7)         397    (2)         404    (2)         411    (2)
                                                           418    (2)         425    (2)         432    (2)         439    (2)
                                                           446    (2)         453    (2)         460    (2)         467    (2)
                                                           474    (2)         481    (2)         488    (2)         495    (2)
                                                           502    (2)         509    (2)
M_RLS_BUS                      =00000C00     171   (2)
M_RUN                          =00000001     102   (2)  #-3871    (33)     #-4030    (34)
M_TIMEOUT                      =00000004     120   (2)  #-1411    (7)      #-3870    (33)     #-4029    (34)
M_TM_DLY                       =00004000     201   (2)
M_TRANSFER                     =00000010     104   (2)  #-3868    (33)     #-4027    (34)
M_TWO_XFR                      =00000800     170   (2)     488    (2)         502    (2)
M_UBI_NON_STS                  =7FFE3FFF     149   (2)  #-1499    (9)      #-1516    (9)
M_UBI_NXM_ERR                  =00010000     142   (2)
M_UBI_PB_ERR                   =00008000     144   (2)
M_UBI_RDS_ERR                  =80000000     140   (2)
M_UBI_STS                      =8001C000     148   (2)  #-1515    (9)      #-2184    (16)     #-2285    (17)     #-2394    (18)
                                                        #-2491    (19)     #-2596    (20)     #-2703    (21)     #-2823    (22)
                                                        #-2920    (23)     #-3019    (24)     #-3120    (25)     #-3250    (26)
                                                        #-3360    (27)     #-3458    (28)     #-3542    (29)     #-3619    (30)
                                                        #-959     (6)
M_UBI_WR_ERR                   =00004000     146   (2)
M_UNX_SSYN_ERR                 =00000040     126   (2)
M_WNG_A                        =00000200     192   (2)
M_WNG_GNT                      =00000020     184   (2)
NO_ACCESS                       0000171B-R  1024   (6)    1903    (14)        3827    (33)
PAR$M_ATDEF                    =00000010      79   (2)
PAR$M_ATHI                     =00000008      79   (2)
PAR$M_ATLO                     =00000004      79   (2)
PAR$M_NODEF                    =00000002      79   (2)
PAR$V_ATDEF                    =00000004      79   (2)
PAR$V_ATHI                     =00000003      79   (2)
PAR$V_ATLO                     =00000002      79   (2)
PAR$V_NODEF                    =00000001      79   (2)
PAR$_BIN                       =00000002      79   (2)
PAR$_DEC                       =0000000A      79   (2)
PAR$_HEX                       =00000010      79   (2)
PAR$_NO                        =00000000      79   (2)
PAR$_OCT                       =00000008      79   (2)
PAR$_YES                       =00000001      79   (2)
POWER                          =00000003      85   (2)
PR$L_UB_INIT                   =00000037     293   (2)  #-2030    (15)     #-2137    (16)     #-2243    (17)     #-2349    (18)
                                                        #-2452    (19)     #-2556    (20)     #-2656    (21)     #-2781    (22)
                                                        #-2883    (23)     #-2981    (24)     #-3080    (25)     #-3208    (26)
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                                                       #-3318   (27)   #-3418   (28)   #-3501   (29)   #-3583   (30)
                                                       #-3809   (33)   #-3989   (34)
PR$_ICCS                   00000000-XR                 #-1410   (7)    #-3866   (33)   #-3868   (33)   #-3871   (33)
                                                       #-3878   (33)   #-4025   (34)   #-4027   (34)   #-4030   (34)
                                                       #-4037   (34)
PR$_MCESR                  00000000-XR                 #-1197   (7)
PR$_NICR                   00000000-XR                 #-3867   (33)   #-3869   (33)   #-4026   (34)   #-4028   (34)
PSL$C_EXEC                 =00000001       80     (2)
PSL$C_KERNEL               =00000000       80     (2)
PSL$C_SUPER                =00000002       80     (2)
PSL$C_USER                 =00000003       80     (2)
PSL$K_EXEC                 =00000001       80     (2)
PSL$K_KERNEL               =00000000       80     (2)
PSL$K_SUPER                =00000002       80     (2)
PSL$K_USER                 =00000003       80     (2)
PSL$M_C                    =00000001       80     (2)
PSL$M_CBIT                 =00000001       80     (2)
PSL$M_CM                   =80000000       80     (2)        80      (2)
PSL$M_CURMOD               =03000000       80     (2)
PSL$M_DV                   =00000080       80     (2)
PSL$M_FPD                  =08000000       80     (2)        80      (2)
PSL$M_FU                   =00000040       80     (2)
PSL$M_IPL                  =001F0000       80     (2)
PSL$M_IS                   =04000000       80     (2)
PSL$M_IV                   =00000020       80     (2)
PSL$M_N                    =00000008       80     (2)
PSL$M_NBIT                 =00000008       80     (2)
PSL$M_PRVMOD               =00C00000       80     (2)
PSL$M_SAFBITS              =000037FF       80     (2)
PSL$M_TBIT                 =00000010       80     (2)
PSL$M_TP                   =40000000       80     (2)        80      (2)
PSL$M_V                    =00000002       80     (2)
PSL$M_VBIT                 =00000002       80     (2)
PSL$M_Z                    =00000004       80     (2)
PSL$M_ZBIT                 =00000004       80     (2)
PSL$S_CURMOD               =00000002       80     (2)
PSL$S_IPL                  =00000005       80     (2)
PSL$S_PRVMOD               =00000002       80     (2)
PSL$V_C                    =00000000       80     (2)
PSL$V_CBIT                 =00000000       80     (2)
PSL$V_CM                   =0000001F       80     (2)
PSL$V_CURMOD               =00000018       80     (2)
PSL$V_DV                   =00000007       80     (2)
PSL$V_FPD                  =0000001B       80     (2)
PSL$V_FU                   =00000006       80     (2)
PSL$V_IPL                  =00000010       80     (2)
PSL$V_IS                   =0000001A       80     (2)
PSL$V_IV                   =00000005       80     (2)
PSL$V_N                    =00000003       80     (2)
PSL$V_NBIT                 =00000003       80     (2)
PSL$V_PRVMOD               =00000016       80     (2)
PSL$V_TBIT                 =00000004       80     (2)
PSL$V_TP                   =0000001E       80     (2)
PSL$V_V                    =00000001       80     (2)
PSL$V_VBIT                 =00000001       80     (2)
PSL$V_Z                    =00000002       80     (2)
PSL$V_ZBIT                 =00000002       80     (2)
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RD_MLLR_DECODE                   0000175E-R   1065    (7)      1707     (12)
RD_MLLR_ENCODE                   0000172F-R   1045    (7)      1683     (12)
RD_MLLR_TBL                      00000237-R   344     (2)     #-1056    (7)      #-1686    (12)    #-805     (6)
RETRIEVE_TBL                     00000257-R   349     (2)     #-1071    (7)      #-1697    (12)    #-805     (6)
SCB$L_ACCESS                     00000020     76      (2)
SCB$L_ARITH                      00000034     76      (2)
SCB$L_BE0                       =00000348     220     (2)     #-3738    (32)     #-4104    (34)
SCB$L_BE1                       =0000034C     221     (2)     #-3739    (32)     #-4105    (34)
SCB$L_BE2                       =00000350     222     (2)     #-3740    (32)     #-4106    (34)
SCB$L_BE3                       =00000354     223     (2)     #-3741    (32)     #-3987    (34)    #-4107    (34)
SCB$L_BREAK                      0000002C     76      (2)
SCB$L_CHME                       00000044     76      (2)
SCB$L_CHMK                       00000040     76      (2)
SCB$L_CHMS                       00000048     76      (2)
SCB$L_CHMU                       0000004C     76      (2)
SCB$L_COMPAT                     00000030     76      (2)
SCB$L_KNLSTK                     00000008     76      (2)
SCB$L_MACHCHK                    00000004     76      (2)     #-1162    (7)      #-1189    (7)
SCB$L_OPCCUS                     00000014     76      (2)
SCB$L_OPCDEC                     00000010     76      (2)
SCB$L_POWER                      0000000C     76      (2)
SCB$L_RADRMOD                    0000001C     76      (2)
SCB$L_ROPRAND                    00000018     76      (2)
SCB$L_RXDB                       000000F8     76      (2)
SCB$L_SFTLVL1                    00000084     76      (2)
SCB$L_SFTLVL10                   000000A8     76      (2)
SCB$L_SFTLVL11                   000000AC     76      (2)
SCB$L_SFTLVL12                   000000B0     76      (2)
SCB$L_SFTLVL13                   000000B4     76      (2)
SCB$L_SFTLVL14                   000000B8     76      (2)
SCB$L_SFTLVL15                   000000BC     76      (2)
SCB$L_SFTLVL2                    00000088     76      (2)
SCB$L_SFTLVL3                    0000008C     76      (2)
SCB$L_SFTLVL4                    00000090     76      (2)
SCB$L_SFTLVL5                    00000094     76      (2)
SCB$L_SFTLVL6                    00000098     76      (2)
SCB$L_SFTLVL7                    0000009C     76      (2)
SCB$L_SFTLVL8                    000000A0     76      (2)
SCB$L_SFTLVL9                    000000A4     76      (2)
SCB$L_TBIT                       00000028     76      (2)
SCB$L_TIMER                      000000C0     76      (2)     #-3745    (32)     #-4108    (34)
SCB$L_TRANSL                     00000024     76      (2)
SCB$L_TXDB                       000000FC     76      (2)
SCB$L_ZERO                       00000000     76      (2)
SEP_FUNCTIONAL                  =00000002     64      (2)
SEP_REPAIR                      =00000003     64      (2)
SET_UP_MAPS                      0000194D-R   1247    (7)      3850     (33)      4003     (34)
SIZ...                          =00000001     84      (2)      64       (2)       77       (2)      79       (2)       80       (2)
                                                               83       (2)       84       (2)

SYS$ALLOC                        00010238     82      (2)
SYS$ASCTIM                       00010248     82      (2)
SYS$ASSIGN                       00010250     82      (2)
SYS$BINTIM                       00010258     82      (2)
SYS$CANCEL                       00010260     82      (2)
SYS$CANTIM                       00010268     82      (2)
SYS$CLOSE                        000105B8     82      (2)
SYS$CLREF                        00010298     82      (2)
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SYS$CONNECT                        000105C0      82     (2)
SYS$DALLOC                         000102D8      82     (2)
SYS$DASSGN                         000102E0      82     (2)
SYS$DISCONNECT                     000105D0      82     (2)
SYS$FAO                            00010350      82     (2)
SYS$FAOL                           00010358      82     (2)
SYS$GET                            00010580      82     (2)
SYS$GETCHN                         000104C8      82     (2)
SYS$GETTIM                         00010378      82     (2)
SYS$LKWSET                         000103A0      82     (2)
SYS$NUMTIM                         000103B8      82     (2)
SYS$OPEN                           00010608      82     (2)
SYS$QIO                            000103C8      82     (2)
SYS$QIOW                           00010200      82     (2)
SYS$READ                           00010590      82     (2)
SYS$READEF                         000103D0      82     (2)
SYS$SETAST                         000103F8      82     (2)
SYS$SETEF                          00010400      82     (2)
SYS$SETIMR                         00010420      82     (2)
SYS$SETPRI                         00010428      82     (2)
SYS$SETPRT                         00010430      82     (2)
SYS$SETRWM                         00010438      82     (2)
SYS$SETSWM                         00010448      82     (2)
SYS$ULKPAG                         00010460      82     (2)
SYS$ULWSET                         00010468      82     (2)
SYS$UNWIND                         00010470      82     (2)
SYS$WAITFR                         00010478      82     (2)
SYS$WFLAND                         00010488      82     (2)
SYS$WFLOR                          00010490      82     (2)
T8_S1                              0000003C-R    1479   (9)
T8_S10                             00000A61-R    2450   (19)
T8_S10_X                           00000B76-R    2517   (19)
T8_S11                             00000B81-R    2554   (20)
T8_S11_X                           00000C9A-R    2621   (20)
T8_S12                             00000CA5-R    2654   (21)
T8_S12_X                           00000E3B-R    2746   (21)
T8_S13                             00000E46-R    2779   (22)
T8_S13_X                           00000F69-R    2848   (22)
T8_S14                             00000F74-R    2881   (23)
T8_S14_X                           00001085-R    2946   (23)
T8_S15                             00001090-R    2979   (24)
T8_S15_X                           000011A7-R    3045   (24)
T8_S16                             000011B2-R    3078   (25)
T8_S16_X                           0000132B-R    3163   (25)
T8_S17                             00001336-R    3205   (26)
T8_S17_X                           0000147F-R    3272   (26)
T8_S18                             0000148A-R    3315   (27)
T8_S18_X                           000015D0-R    3382   (27)
T8_S19                             000015DB-R    3414   (28)
T8_S19_X                           000016D6-R    3465   (28)
T8_S1_X                            0000012F-R    1530   (9)
T8_S2                              0000013A-R    1561   (10)
T8_S20                             000016E1-R    3499   (29)
T8_S20_X                           000017DD-R    3549   (29)
T8_S21                             000017E8-R    3581   (30)
T8_S21_X                           000018D5-R    3626   (30)
T8_S22                             000018E0-R    3654   (31)
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                                                                   E  8
ZZ-ENKAX-1.3    Cross reference                                  3-AUG-1983         Fiche 3  Frame E8           Sequence 507
ENKAXH                          VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:54:13  VAX-11 Macro V03-00         Page 134
Cross reference                                                           3-AUG-1983 10:02:08  WRKD$0:[PAN.ENKAX]ENKAXH.MAR;76  (34)

T8_S22_X                        0000198A-R   3693  (31)
T8_S2_X                         000001A6-R   1586  (10)
T8_S3                           000001B1-R   1679  (12)
T8_S3_X                         00000244-R   1719  (12)
T8_S4                           0000024F-R   1759  (13)
T8_S4_X                         00000332-R   1815  (13)
T8_S5                           0000033D-R   1887  (14)
T8_S5_X                         0000049E-R   1974  (14)
T8_S6                           000004A9-R   2008  (15)
T8_S6_X                         00000652-R   2083  (15)
T8_S7                           0000065D-R   2124  (16)
T8_S7_X                         000007D9-R   2203  (16)
T8_S8                           000007E4-R   2240  (17)
T8_S8_X                         0000091F-R   2309  (17)
T8_S9                           0000092A-R   2347  (18)
T8_S9_X                         00000A56-R   2419  (18)
T9_S1                           000000C0-R   3807  (33)
T9_S1_X                         000003A3-R   3940  (33)
T9_S2                           000003AE-R   3985  (34)
T9_S2_X                         00000620-R   4102  (34)
TEST_008                        00000020-R   1428  (8)      1428   (8)
TEST_008_X                      00001998-R   3695  (31)   #-1433   (8)    #-1905   (14)   #-2151   (16)
TEST_009                        00000020-R   3722  (32)     3722   (32)
TEST_009_X                      0000066F-R   4110  (34)   #-3730   (32)   #-3828   (33)
TIMER_SERVICE                   00001AA4-R   1408  (7)      3745   (32)
TU58                           =00000002     85    (2)
T_ACTL_INTR                     00001204-R   737   (4)      991    (6)
T_ADR_REG_ERR                   00000511-R   546   (4)      1921   (14)
T_AO_DATIP_ERR                  000006EC-R   579   (4)      3103   (25)     3131   (25)     3148   (25)
T_AO_DATI_ERR                   000006B3-R   576   (4)      2805   (22)     2834   (22)
T_AO_DATOB_ERR                  00000679-R   573   (4)      3003   (24)     3030   (24)
T_AO_DATO_ERR                   00000640-R   570   (4)      2904   (23)     2931   (23)
T_BUFF_ADR                      00000953-R   617   (4)      901    (6)
T_BYTE_ERR                      00000D72-R   665   (4)    #-1966   (14)   #-2607   (20)   #-3030   (24)
T_CHANNEL_ERR                   000012FF-R   746   (4)      2017   (15)     2027   (15)     2133   (16)
T_CSR_ERR                       00000463-R   534   (4)      1494   (9)      1509   (9)      1526   (9)
T_CSR_NCL_ERR                   0000114D-R   725   (4)      961    (6)
T_DATA_REG_ERR                  00000540-R   549   (4)      1943   (14)     1966   (14)
T_DATIP_ERR                     000005D3-R   561   (4)      2686   (21)     2714   (21)     2731   (21)
T_DATI_ERR                      0000056C-R   552   (4)      2166   (16)     2194   (16)
T_DATOB_ERR                     000005FB-R   564   (4)      2580   (20)     2607   (20)
T_DATO_ERR                      0000061E-R   567   (4)      2475   (19)     2502   (19)
T_D_ERR_HDR                     000008B5-R   609   (4)      774    (6)      821    (6)
T_D_PATH_ERR                    0000058E-R   555   (4)      2376   (18)     2405   (18)
T_EXP_INTR                      00001174-R   728   (4)      977    (6)
T_IHWE                          0000133C-R   749   (4)      1005   (6)
T_INTR_ERR                      000007DF-R   594   (4)      2042   (15)     2054   (15)     2071   (15)
T_INT_SSYN_ERR                  00000F9E-R   700   (4)      868    (6)
T_IVVECT                        00001393-R   755   (4)      1016   (6)
T_LOGIC                         00001360-R   752   (4)      1010   (6)
T_LONG_ERR                      00000DC8-R   671   (4)    #-1509   (9)    #-1526   (9)    #-1579   (10)   #-1776   (13)
                                                          #-1793   (13)   #-1809   (13)
T_M1_UBE_0                      0000096B-R   620   (4)      269    (2)
T_M1_UBE_1                      000009F4-R   625   (4)      270    (2)
T_M1_UBE_2                      00000A62-R   629   (4)      271    (2)
T_M1_UBE_3                      00000AA5-R   633   (4)      272    (2)
T_M2_UBE_0                      00000AE8-R   637   (4)      273    (2)
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T_M2_UBE_1                      00000B4C-R   641    (4)      274    (2)
T_M2_UBE_2                      00000BAD-R   645    (4)      275    (2)
T_M2_UBE_3                      00000C1E-R   649    (4)      276    (2)
T_MAPS_USED                     00000C9F-R   654    (4)      922    (6)
T_MAP_ABUS_ERR                  000004AC-R   540    (4)     1715    (12)
T_MAP_ADR_ERR                   00001236-R   740    (4)      805    (6)
T_MAP_DBUS_ERR                  00000482-R   537    (4)     1579    (10)
T_MAP_ENT_ERR                   000004D9-R   543    (4)     1776    (13)     1793    (13)     1809    (13)
T_MAP_FCN_ERR                   0000075A-R   585    (4)     3233    (26)     3261    (26)     3343    (27)     3371    (27)
T_MAP_INV_ERR                   0000080D-R   597    (4)     3674    (31)     3690    (31)
T_MAP_SEL_ERR                   000005B0-R   558    (4)     2268    (17)     2296    (17)
T_MAP_USED                      00000CC7-R   657    (4)      833    (6)
T_MAX_LAT_ERR                   00000E6D-R   683    (4)      853    (6)
T_MULT1_ERR                     0000083A-R   600    (4)     3899    (33)     3910    (33)     3929    (33)     4051    (34)
                                                            4072    (34)     4091    (34)
T_MXFR_1_DESC                   0000012F-R   269    (2)    #-3899   (33)    #-3910   (33)    #-3929   (33)
T_MXFR_2_DESC                   0000013F-R   273    (2)    #-4051   (34)    #-4072   (34)    #-4091   (34)
T_MXFR_D_ERR                    00000866-R   603    (4)      904    (6)
T_MXFR_ERR_HDR                  00000CE7-R   660    (4)      905    (6)
T_MXFR_TYPE                     00000939-R   614    (4)      896    (6)
T_NO_ACCESS                     000003C3-R   522    (4)     1903    (14)     3827    (33)
T_NO_BEO                        00000397-R   519    (4)     1432    (8)
T_NO_CSR_ERR                    00000888-R   606    (4)      939    (6)
T_NO_GNT_ERR                    00000F50-R   696    (4)      865    (6)
T_NO_INTR                       000011DF-R   734    (4)      985    (6)
T_NO_MAPS                       00000437-R   531    (4)     2150    (16)
T_NO_NXM_ERR                    00001052-R   710    (4)      949    (6)
T_NO_PB_ERR                     000010A7-R   716    (4)      954    (6)
T_NO_RDY_ERR                    00000E0D-R   677    (4)      847    (6)
T_NO_SACK_ERR                   00000EA4-R   686    (4)      856    (6)
T_NO_SSYN_ERR                   00000ECA-R   689    (4)      859    (6)
T_NO_UBE                        00000414-R   528    (4)     3729    (32)
T_NO_WR_ERR                     00001117-R   722    (4)      944    (6)
T_NXM_ERR                       000007B6-R   591    (4)     3605    (30)     3624    (30)
T_PB_ERR                        00000786-R   588    (4)     3513    (29)     3547    (29)
T_PG_BND_WR_ERR                 0000072B-R   582    (4)     3444    (28)     3463    (28)
T_UBE_ADR                       000003E5-R   525    (4)     1030    (6)
T_UBI_NXM_ERR                   0000101E-R   707    (4)      871    (6)
T_UBI_PB_ERR                    00001081-R   713    (4)      874    (6)
T_UBI_RDS_ERR                   00000FEA-R   704    (4)      880    (6)
T_UBI_WR_ERR                    000010DF-R   719    (4)      877    (6)
T_UNXP_INTR                     000011B4-R   731    (4)      981    (6)
T_UNX_SSYN_ERR                  00000DE4-R   674    (4)      957    (6)
T_WNG_A_ERR                     00000F02-R   692    (4)      862    (6)
T_WNG_GNT_ERR                   00000E40-R   680    (4)      850    (6)
T_WORD_ERR                      00000DA0-R   668    (4)    #-1921   (14)    #-1943   (14)    #-2194   (16)    #-2296   (17)
                                                           #-2405   (18)    #-2502   (19)    #-2714   (21)    #-2731   (21)
                                                           #-2834   (22)    #-2931   (23)    #-3131   (25)    #-3148   (25)
                                                           #-3261   (26)    #-3371   (27)      914    (6)
UBE_0_MULT_1                    00000337-R   455    (2)     3847    (33)
UBE_0_MULT_2                    00000367-R   483    (2)     3996    (34)
UBE_1_MULT_1                    00000343-R   462    (2)
UBE_1_MULT_2                    00000373-R   490    (2)
UBE_2_MULT_1                    0000034F-R   469    (2)
UBE_2_MULT_2                    0000037F-R   497    (2)
UBE_3_MULT_1                    0000035B-R   476    (2)
UBE_3_MULT_2                    0000038B-R   504    (2)
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UBE_BR4_INTR                   0000032B-R   448     (2)
UBE_BR5_INTR                   0000031F-R   441     (2)
UBE_BR6_INTR                   00000313-R   434     (2)
UBE_BR7_INTR                   00000307-R   427     (2)      2031    (15)
UBE_DATIP_1                    000002D7-R   399     (2)      2674    (21)      3092    (25)
UBE_DATI_T                     000002CB-R   392     (2)      2156    (16)      2255    (17)      2364    (18)      2794    (22)
                                                             3220    (26)      3330    (27)      3529    (29)      3591    (30)
                                                             3663    (31)
UBE_DATOB_1                    000002E3-R   406     (2)      2568    (20)      2991    (24)
UBE_DATO_T                     000002EF-R   413     (2)      2461    (19)      2891    (23)      3432    (28)
UBE_PB_ERR                     000002FB-R   420     (2)
UBE_SET_UP                     00001850-R   1133    (7)      2048    (15)      2172    (16)      2274    (17)      2383    (18)
                                                             2481    (19)      2586    (20)      2692    (21)      2812    (22)
                                                             2910    (23)      3009    (24)      3109    (25)      3239    (26)
                                                             3349    (27)      3450    (28)      3534    (29)      3611    (30)
                                                             3680    (31)      3860    (33)      4016    (34)
UBI                           =0000000A     85      (2)      1428    (8)       3722    (32)
UNIBUS_SIZER                   00001867-R   1153    (7)      2138    (16)      3734    (32)
VAL_MAPS                       0000190D-R   1215    (7)
V_BR_INTR                     =00000003     123     (2)     #-2050   (15)     #-2066   (15)     #-983    (6)
V_BYTE_OFF                    =00000019     96      (2)     #-1072   (7)
V_CCOVF                       =0000000D     200     (2)
V_CLK_ERR                     =0000001F     111     (2)
V_CLK_INTR                    =00000007     109     (2)
V_DATA_ERR                    =0000000C     135     (2)     #-818    (6)
V_ENABLE                      =00000006     107     (2)
V_ERR                         =0000000F     176     (2)     #-2183   (16)     #-2287   (17)     #-2396   (18)     #-2493   (19)
                                                            #-2598   (20)     #-2705   (21)     #-2825   (22)     #-2922   (23)
                                                            #-3021   (24)     #-3122   (25)     #-3252   (26)     #-3362   (27)
V_EXP_BR_INTR                 =00000001     119     (2)     #-974    (6)
V_EXP_NXM_ERR                 =00000009     131     (2)     #-947    (6)
V_EXP_PB_ERR                  =0000000A     133     (2)     #-952    (6)
V_EXP_WR_ERR                  =00000007     129     (2)     #-942    (6)
V_INTR_ERR                    =00000004     125     (2)     #-2067   (15)
V_INT_SSYN                    =0000000B     197     (2)     #-867    (6)
V_MAP_VAL                     =0000001F     98      (2)
V_MAX_LAT                     =00000006     187     (2)     #-852    (6)
V_NO_CSR                      =00000000     117     (2)     #-938    (6)
V_NO_GNT                      =0000000A     195     (2)     #-864    (6)
V_NO_SACK                     =00000007     189     (2)     #-855    (6)
V_NO_SSYN                     =00000008     191     (2)     #-3457   (28)     #-3541   (29)     #-3618   (30)     #-3686   (31)
                                                            #-858    (6)      #-956    (6)
V_RDY                         =00000007     163     (2)     #-2039   (15)     #-2162   (16)     #-2263   (17)     #-2371   (18)
                                                            #-2470   (19)     #-2575   (20)     #-2681   (21)     #-2800   (22)
                                                            #-2899   (23)     #-2998   (24)     #-3098   (25)     #-3228   (26)
                                                            #-3338   (27)     #-3439   (28)     #-3508   (29)     #-3600   (30)
                                                            #-3669   (31)     #-846    (6)
V_RUN                         =00000000     103     (2)
V_TIMEOUT                     =00000002     121     (2)     #-3875   (33)     #-4034   (34)
V_TRANSFER                    =00000004     105     (2)
V_UBI_NXM_ERR                 =00000010     143     (2)     #-3617   (30)     #-870    (6)      #-948    (6)
V_UBI_PB_ERR                  =0000000F     145     (2)     #-3540   (29)     #-873    (6)      #-953    (6)
V_UBI_RDS_ERR                 =0000001F     141     (2)     #-879    (6)
V_UBI_WR_ERR                  =0000000E     147     (2)     #-3456   (28)     #-876    (6)      #-943    (6)
V_UNX_SSYN_ERR                =00000006     127     (2)
V_VALID_MAPS                   00000006-R   229     (2)      1168    (7)       1170    (7)       1183    (7)       1218    (7)
                                                             1231    (7)       1256    (7)       2253    (17)      3218    (26)
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                                          3328  (27)
V_WNG_A         =00000009   193  (2)    #-861  (6)
V_WNG_GNT       =00000005   185  (2)    #-849  (6)
WCS             =00000007   85   (2)
W_FLAGS          00000000-R 206  (2)   #-1351  (7)       #-1354  (7)       #-1357  (7)       #-1411  (7)
                                       #-1481  (9)       #-1491  (9)       #-1563  (10)      #-1684  (12)
                                       #-1761  (13)      #-1889  (14)      #-2038  (15)        2050  (15)
                                       #-2056  (15)      #-2064  (15)        2066  (15)        2067  (15)
                                       #-2073  (15)      #-2136  (16)      #-2181  (16)      #-2196  (16)
                                       #-2242  (17)      #-2282  (17)      #-2298  (17)      #-2350  (18)
                                       #-2391  (18)      #-2407  (18)      #-2453  (19)      #-2489  (19)
                                       #-2504  (19)      #-2557  (20)      #-2594  (20)      #-2609  (20)
                                       #-2657  (21)      #-2700  (21)      #-2716  (21)      #-2722  (21)
                                       #-2733  (21)      #-2782  (22)      #-2820  (22)      #-2836  (22)
                                       #-2884  (23)      #-2918  (23)      #-2933  (23)      #-2982  (24)
                                       #-3017  (24)      #-3032  (24)      #-3081  (25)      #-3117  (25)
                                       #-3133  (25)      #-3140  (25)      #-3150  (25)      #-3207  (26)
                                       #-3247  (26)      #-3263  (26)      #-3317  (27)      #-3357  (27)
                                       #-3373  (27)      #-3416  (28)      #-3417  (28)      #-3502  (29)
                                       #-3504  (29)      #-3585  (30)      #-3586  (30)      #-3657  (31)
                                       #-3837  (33)      #-3870  (33)        3875  (33)      #-3995  (34)
                                       #-4029  (34)        4034  (34)         818  (6)          938  (6)
                                          942  (6)          947  (6)          952  (6)          974  (6)
                                          983  (6)
W_PTRN_TBL       0000029F-R 370  (2)     1909  (14)        1931  (14)        1954  (14)        2360  (18)
                                         2456  (19)        2562  (20)        2666  (21)        2790  (22)
                                         2886  (23)        2985  (24)        3084  (25)      #-3217  (26)
                                       #-3245  (26)      #-3261  (26)      #-3327  (27)      #-3355  (27)
                                       #-3371  (27)
W_UBI_STS_2      000000B3-R 242  (2)     1355  (7)          988  (6)
W_VECTOR         000000B5-R 243  (2)   #-1016  (6)       #-1352  (7)        #-991  (6)
XFER_ERR         00001420-R 814  (6)     2042  (15)        2166  (16)        2194  (16)        2268  (17)
                                         2296  (17)        2376  (18)        2405  (18)        2475  (19)
                                         2502  (19)        2580  (20)        2607  (20)        2686  (21)
                                         2714  (21)        2731  (21)        2805  (22)        2834  (22)
                                         2904  (23)        2931  (23)        3003  (24)        3030  (24)
                                         3103  (25)        3131  (25)        3148  (25)        3233  (26)
                                         3261  (26)        3343  (27)        3371  (27)        3444  (28)
                                         3513  (29)        3605  (30)        3674  (31)
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                                        +--------------------------+
                                        ! Macros Cross Reference !
                                        +--------------------------+
MACRO                SIZE             DEFINITION        REFERENCES...
-----                ----             ----------        -------------
$D1_ABTEST           1                2018    (15)      2018    (15)     2028    (15)     2044    (15)     2134    (16)     2168    (16)
                                                        2270    (17)     2378    (18)     2477    (19)     2582    (20)     2688    (21)
                                                        2807    (22)     2906    (23)     3005    (24)     3105    (25)     3235    (26)
                                                        3345    (27)     3446    (28)     3515    (29)     3607    (30)     3676    (31)
$D1_BSUBT            1                1479    (9)       1479    (9)      1561    (10)     1679    (12)     1759    (13)     1887    (14)
                                                        2008    (15)     2124    (16)     2240    (17)     2347    (18)     2450    (19)
                                                        2554    (20)     2654    (21)     2779    (22)     2881    (23)     2979    (24)
                                                        3078    (25)     3205    (26)     3315    (27)     3414    (28)     3499    (29)
                                                        3581    (30)     3654    (31)     3807    (33)     3985    (34)
$D1_BTEST            1                1428    (8)       1428    (8)      3722    (32)
$D1_ERR              1                1494    (9)       1494    (9)      1509    (9)      1526    (9)      1579    (10)     1715    (12)
                                                        1776    (13)     1793    (13)     1809    (13)     1903    (14)     1921    (14)
                                                        1943    (14)     1966    (14)     2017    (15)     2027    (15)     2042    (15)
                                                        2054    (15)     2071    (15)     2133    (16)     2166    (16)     2194    (16)
                                                        2268    (17)     2296    (17)     2376    (18)     2405    (18)     2475    (19)
                                                        2502    (19)     2580    (20)     2607    (20)     2686    (21)     2714    (21)
                                                        2731    (21)     2805    (22)     2834    (22)     2904    (23)     2931    (23)
                                                        3003    (24)     3030    (24)     3103    (25)     3131    (25)     3148    (25)
                                                        3233    (26)     3261    (26)     3343    (27)     3371    (27)     3444    (28)
                                                        3463    (28)     3513    (29)     3547    (29)     3605    (30)     3624    (30)
                                                        3674    (31)     3690    (31)     3827    (33)     3899    (33)     3910    (33)
                                                        3929    (33)     4051    (34)     4072    (34)     4091    (34)
$D1_ERR_S            1                1494    (9)       1494    (9)      1509    (9)      1526    (9)      1579    (10)     1715    (12)
                                                        1776    (13)     1793    (13)     1809    (13)     1903    (14)     1921    (14)
                                                        1943    (14)     1966    (14)     2017    (15)     2027    (15)     2042    (15)
                                                        2054    (15)     2071    (15)     2133    (16)     2166    (16)     2194    (16)
                                                        2268    (17)     2296    (17)     2376    (18)     2405    (18)     2475    (19)
                                                        2502    (19)     2580    (20)     2607    (20)     2686    (21)     2714    (21)
                                                        2731    (21)     2805    (22)     2834    (22)     2904    (23)     2931    (23)
                                                        3003    (24)     3030    (24)     3103    (25)     3131    (25)     3148    (25)
                                                        3233    (26)     3261    (26)     3343    (27)     3371    (27)     3444    (28)
                                                        3463    (28)     3513    (29)     3547    (29)     3605    (30)     3624    (30)
                                                        3674    (31)     3690    (31)     3827    (33)     3899    (33)     3910    (33)
                                                        3929    (33)     4051    (34)     4072    (34)     4091    (34)
$D1_ESUBT            1                1530    (9)       1530    (9)      1586    (10)     1719    (12)     1815    (13)     1974    (14)
                                                        2083    (15)     2203    (16)     2309    (17)     2419    (18)     2517    (19)
                                                        2621    (20)     2746    (21)     2848    (22)     2946    (23)     3045    (24)
                                                        3163    (25)     3272    (26)     3382    (27)     3465    (28)     3549    (29)
                                                        3626    (30)     3693    (31)     3940    (33)     4102    (34)
$D1_ETEST            1                3695    (31)      3695    (31)     4110    (34)
$D1_EXTEST           1                1433    (8)       1433    (8)      1905    (14)     2151    (16)     3730    (32)     3828    (33)
$D1_PRINT_S          1                774     (6)       1005    (6)      1010    (6)      1016    (6)      1030    (6)      1432    (8)
                                                        2150    (16)     3729    (32)     774     (6)      782     (6)      805     (6)
                                                        821     (6)      827     (6)      833     (6)      847     (6)      850     (6)
                                                        853     (6)      856     (6)      859     (6)      862     (6)      865     (6)
                                                        868     (6)      871     (6)      874     (6)      877     (6)      880     (6)
                                                        896     (6)      898     (6)      901     (6)      904     (6)      905     (6)
                                                        914     (6)      922     (6)      939     (6)      944     (6)      949     (6)
                                                        954     (6)      957     (6)      961     (6)      977     (6)      981     (6)
                                                        985     (6)      991     (6)
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                                                                             J  8
ZZ-ENKAX-1.3         Cross reference                                    3-AUG-1983            Fiche 3  Frame J8          Sequence 512
ENKAXH                                   VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:54:13  VAX-11 Macro V03-00         Page 139
Cross reference                                                            3-AUG-1983 10:02:08  WRKD$0:[PAN.ENKAX]ENKAXH.MAR;76  (34)

$D1_SBTTL           2               1417  (8)       1417  (8)       1439  (9)       1534  (10)      1591  (12)      1723  (13)
                                                    1819  (14)      1978  (15)      2087  (16)      2207  (17)      2313  (18)
                                                    2423  (19)      2521  (20)      2625  (21)      2750  (22)      2852  (23)
                                                    2950  (24)      3049  (25)      3167  (26)      3276  (27)      3386  (28)
                                                    3469  (29)      3553  (30)      3630  (31)      3704  (32)      3757  (33)
                                                    3944  (34)
$D2_BDATA           1               1428  (8)       1428  (8)       3722  (32)
$D2_BTEST           1               1428  (8)       1428  (8)       3722  (32)
$D2_SBTTL           1               1417  (8)       1417  (8)       3704  (32)
$DEF                1               84    (2)       76    (2)       77    (2)       82    (2)       83    (2)       84    (2)
$DEFEND             1               76    (2)       76    (2)       77    (2)       80    (2)       82    (2)       83    (2)
                                                    84    (2)
$DEFINI             1               76    (2)       76    (2)       77    (2)       80    (2)       82    (2)       83    (2)
                                                    84    (2)
$DS_ABORT           1               2018  (15)      2018  (15)      2028  (15)      2044  (15)      2134  (16)      2168  (16)
                                                    2270  (17)      2378  (18)      2477  (19)      2582  (20)      2688  (21)
                                                    2807  (22)      2906  (23)      3005  (24)      3105  (25)      3235  (26)
                                                    3345  (27)      3446  (28)      3515  (29)      3607  (30)      3676  (31)
$DS_BGNMESSAGE      1               772   (6)       1001  (6)       1026  (6)       772   (6)       794   (6)       816   (6)
                                                    894   (6)       936   (6)       972   (6)
$DS_BGNMOD          1               64    (2)       64    (2)
$DS_BGNSUB          1               1479  (9)       1479  (9)       1561  (10)      1679  (12)      1759  (13)      1887  (14)
                                                    2008  (15)      2124  (16)      2240  (17)      2347  (18)      2450  (19)
                                                    2554  (20)      2654  (21)      2779  (22)      2881  (23)      2979  (24)
                                                    3078  (25)      3205  (26)      3315  (27)      3414  (28)      3499  (29)
                                                    3581  (30)      3654  (31)      3807  (33)      3985  (34)
$DS_BGNTEST         1               1428  (8)       1428  (8)       3722  (32)
$DS_BNERROR         1               1489  (9)       1489  (9)       1898  (14)      2014  (15)      2024  (15)      2130  (16)
                                                    3822  (33)
$DS_BQUICK          1               3935  (33)      3935  (33)      4096  (34)
$DS_BREAK           1               1175  (7)       1175  (7)       3695  (31)      3834  (33)      4000  (34)      4110  (34)
$DS_CANWAIT_S       1               1350  (7)       1350  (7)       1370  (7)
$DS_CHANNEL_S       1               2010  (15)      2010  (15)      2020  (15)      2126  (16)      3697  (31)
$DS_CKLOOP          1               1511  (9)       1511  (9)       1528  (9)       1581  (10)      1778  (13)      1795  (13)
                                                    1811  (13)      1923  (14)      1945  (14)      1968  (14)      2197  (16)
                                                    2299  (17)      2408  (18)      2505  (19)      2610  (20)      2734  (21)
                                                    2837  (22)      2934  (23)      3033  (24)      3151  (25)      3264  (26)
                                                    3374  (27)
$DS_CLRVEC_S        1               1189  (7)       1189  (7)       4104  (34)      4105  (34)      4106  (34)      4107  (34)
                                                    4108  (34)
$DS_DSADEF          1               77    (2)       77    (2)
$DS_DSBDEF          1               77    (2)
$DS_DSDEF           2               78    (2)       78    (2)
$DS_DSSDEF          1               82    (2)       82    (2)
$DS_ENDDATA         1               1428  (8)       1428  (8)       3722  (32)
$DS_ENDMESSAGE      1               784   (6)       1018  (6)       1032  (6)       784   (6)       807   (6)       836   (6)
                                                    926   (6)       963   (6)       993   (6)
$DS_ENDMOD          1               4112  (34)      4112  (34)
$DS_ENDSUB          1               1530  (9)       1530  (9)       1586  (10)      1719  (12)      1815  (13)      1974  (14)
                                                    2083  (15)      2203  (16)      2309  (17)      2419  (18)      2517  (19)
                                                    2621  (20)      2746  (21)      2848  (22)      2946  (23)      3045  (24)
                                                    3163  (25)      3272  (26)      3382  (27)      3465  (28)      3549  (29)
                                                    3626  (30)      3693  (31)      3940  (33)      4102  (34)
$DS_ENDTEST         1               3695  (31)      3695  (31)      4110  (34)
$DS_ENVDEF          2               64    (2)       64    (2)
$DS_ERRDEF          1               81    (2)       81    (2)
$DS_ERRHARD_S       1               1492  (9)       1492  (9)       1503  (9)       1520  (9)       1573  (10)      1712  (12)
```

```
                                                     1770   (13)     1787   (13)     1803   (13)     1900   (14)     1915   (14)
                                                     1937   (14)     1960   (14)     2015   (15)     2025   (15)     2040   (15)
                                                     2052   (15)     2069   (15)     2131   (16)     2165   (16)     2187   (16)
                                                     2266   (17)     2289   (17)     2374   (18)     2398   (18)     2473   (19)
                                                     2495   (19)     2578   (20)     2600   (20)     2684   (21)     2707   (21)
                                                     2724   (21)     2803   (22)     2827   (22)     2902   (23)     2924   (23)
                                                     3001   (24)     3023   (24)     3101   (25)     3124   (25)     3141   (25)
                                                     3231   (26)     3254   (26)     3341   (27)     3364   (27)     3442   (28)
                                                     3461   (28)     3511   (29)     3545   (29)     3603   (30)     3622   (30)
                                                     3672   (31)     3688   (31)     3824   (33)     3895   (33)     3906   (33)
                                                     3925   (33)     4047   (34)     4068   (34)     4087   (34)
$DS_EXIT            1                1433   (8)      1433   (8)      1905   (14)     2151   (16)     3730   (32)     3828   (33)
$DS_HPODEF          2                83     (2)      83     (2)
$DS_KA_DEF          3                84     (2)      84     (2)
$DS_PAGE            1                1415   (7)      1415   (7)      1437   (8)      1532   (9)      1588   (10)     1721   (12)
                                                     1817   (13)     1976   (14)     2085   (15)     2205   (16)     2311   (17)
                                                     2421   (18)     2519   (19)     2623   (20)     2748   (21)     2850   (22)
                                                     2948   (23)     3047   (24)     3165   (25)     3274   (26)     3384   (27)
                                                     3467   (28)     3551   (29)     3628   (30)     3702   (31)     3755   (32)
                                                     3942   (33)
$DS_PARDEF          1                79     (2)      79     (2)
$DS_PRINTB_S        1                774    (6)      1005   (6)      1010   (6)      1015   (6)      1028   (6)      2150   (16)
                                                     774    (6)      778    (6)      800    (6)      821    (6)      823    (6)
                                                     847    (6)      850    (6)      853    (6)      856    (6)      859    (6)
                                                     862    (6)      865    (6)      868    (6)      871    (6)      874    (6)
                                                     877    (6)      880    (6)      896    (6)      898    (6)      900    (6)
                                                     903    (6)      939    (6)      944    (6)      949    (6)      954    (6)
                                                     957    (6)      961    (6)      975    (6)      980    (6)      985    (6)
                                                     989    (6)
$DS_PRINTF_S        1                1432   (8)      1432   (8)      3729   (32)
$DS_PRINTX_S        1                832    (6)      832    (6)      905    (6)      910    (6)      921    (6)
$DS_PROBE_S         1                1485   (9)      1485   (9)      1894   (14)     3818   (33)
$DS_PSLDEF          1                80     (2)      80     (2)
$DS_SBTTL           1                1417   (8)      1417   (8)      1439   (9)      1534   (10)     1591   (12)     1723   (13)
                                                     1819   (14)     1978   (15)     2087   (16)     2207   (17)     2313   (18)
                                                     2423   (19)     2521   (20)     2625   (21)     2750   (22)     2852   (23)
                                                     2950   (24)     3049   (25)     3167   (26)     3276   (27)     3386   (28)
                                                     3469   (29)     3553   (30)     3630   (31)     3704   (32)     3757   (33)
                                                     3944   (34)
$DS_SCBDEF          1                76     (2)      76     (2)
$DS_SECDEF          1                85     (2)      85     (2)
$DS_SETIPL_S        1                2034   (15)     2034   (15)     2062   (15)     2081   (15)
$DS_SETVEC_S        1                1162   (7)      1162   (7)      3738   (32)     3739   (32)     3740   (32)     3741   (32)
                                                     3745   (32)     3987   (34)
$DS_WAITMS_S        1                2049   (15)     2049   (15)     2065   (15)     2173   (16)     2275   (17)     2384   (18)
                                                     2482   (19)     2587   (20)     2693   (21)     2813   (22)     2911   (23)
                                                     3010   (24)     3110   (25)     3240   (26)     3350   (27)     3451   (28)
                                                     3535   (29)     3612   (30)     3681   (31)
$EQU                1                84     (2)      64     (2)      78     (2)      79     (2)      80     (2)
$EQULS1             1                80     (2)      64     (2)      78     (2)      80     (2)
$EQULST             1                64     (2)      64     (2)      78     (2)      80     (2)
$GBLINI             2                64     (2)      64     (2)      76     (2)      77     (2)      78     (2)      79     (2)
                                                     80     (2)      82     (2)      83     (2)      84     (2)
$HP_DEFDEF          1                83     (2)
$KADEF              1                84     (2)
$OFFDEF             1                81     (2)      81     (2)
$PSLDEF             1                80     (2)      80     (2)
```

```
$PUSHADR          1            1494   (9)      1494   (9)     1509   (9)     1526   (9)     1579   (10)     1715   (12)
                                               1776   (13)    1793   (13)    1809   (13)    1903   (14)     1921   (14)
                                               1943   (14)    1966   (14)    2013   (15)    2017   (15)     2023   (15)
                                               2027   (15)    2042   (15)    2049   (15)    2054   (15)     2065   (15)
                                               2071   (15)    2129   (16)    2133   (16)    2166   (16)     2173   (16)
                                               2194   (16)    2268   (17)    2275   (17)    2296   (17)     2376   (18)
                                               2384   (18)    2405   (18)    2475   (19)    2482   (19)     2502   (19)
                                               2580   (20)    2587   (20)    2607   (20)    2686   (21)     2693   (21)
                                               2714   (21)    2731   (21)    2805   (22)    2813   (22)     2834   (22)
                                               2904   (23)    2911   (23)    2931   (23)    3003   (24)     3010   (24)
                                               3030   (24)    3103   (25)    3110   (25)    3131   (25)     3148   (25)
                                               3233   (26)    3240   (26)    3261   (26)    3343   (27)     3350   (27)
                                               3371   (27)    3444   (28)    3451   (28)    3463   (28)     3513   (29)
                                               3535   (29)    3547   (29)    3605   (30)    3612   (30)     3624   (30)
                                               3674   (31)    3681   (31)    3690   (31)    3700   (31)     3827   (33)
                                               3899   (33)    3910   (33)    3929   (33)    4051   (34)     4072   (34)
                                               4091   (34)
$VIELD            1            64     (2)      64     (2)     77     (2)     79     (2)     80     (2)      83     (2)
                                               84     (2)
$VIELD1           1            84     (2)      64     (2)     77     (2)     79     (2)     80     (2)      83     (2)
                                               84     (2)
ENKAX_SECDEF      1            85     (2)      85     (2)

                                          +------------------------+
                                          ! Performance indicators !
                                          +------------------------+

Phase                        Page faults   CPU Time       Elapsed Time
-----                        -----------   --------       ------------
Initialization                       21    00:00:00.05    00:00:00.18
Command processing                   28    00:00:00.19    00:00:00.46
Pass 1                             2661    00:00:45.81    00:01:11.43
Symbol table sort                     3    00:00:01.46    00:00:02.99
Pass 2                             1918    00:00:15.11    00:00:22.66
Symbol table output                 101    00:00:00.55    00:00:00.88
Psect synopsis output                 7    00:00:00.04    00:00:00.08
Cross-reference output              372    00:00:07.15    00:00:09.05
Assembler run totals               5115    00:01:10.36    00:01:48.08

The working set limit was 1000 pages.
511770 bytes (1000 pages) of virtual memory were used to buffer the intermediate code.
There were 50 pages of symbol table space allocated to hold 759 non-local and 295 local symbols.
4113 source lines were read in Pass 1, producing 68 object records in Pass 2.
130 pages of virtual memory were used to define 61 macros.

                                         +--------------------------+
                                         ! Macro library statistics !
                                         +--------------------------+

Macro library name                           Macros defined
------------------                           --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                          1
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                       52
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                       8
TOTALS (all libraries)                                 61

891 GETS were required to define 61 macros.
```

```
There were no errors, warnings or information messages.

/LIS/CRO ENKAXH
```

Table of contents

```
   (1)        1        ENKAXI: MEMORY TEST
   (2)       62        DECLARATIONS
   (3)      127        ERROR MESSAGES
   (4)      173        DATA TABLES
   (5)      247        ERROR REPORTING ROUTINES
   (6)      311        SUBROUTINES
   (7)      361        TEST 10:  Memory
   (8)      384        SUBTEST 10.1:  Memory Size
   (9)      452        SUBTEST 10.2:  Data Path
   (10)     517        SUBTEST 10.3:  Memory March
```

```
0000            .SBTTL  ENKAXI: MEMORY TEST
0000            .TITLE  ENKAXI  VAX-11/730 Specific CPU Cluster Exerciser
0000            .IDENT  /1-3/
0000
0000    ;
0000    ; Copyright (C) 1981
0000    ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000    ;
0000    ; This software is furnished  under a license for use only on a single
0000    ; computer  system and  may be  copied only with  the inclusion of the
0000    ; above copyright notice.  This software, or any other copies thereof,
0000    ; may not be provided or  otherwise made available to any other person
0000    ; except for use on such system and to one who agrees to these license
0000    ; terms.  Title to and  ownership of the  software  shall at all times
0000    ; remain in DEC.
0000    ;
0000    ; The information in this software is subject to change without notice
0000    ; and should  not be construed  as a commitment  by Digital  Equipment
0000    ; Corporation.
0000    ;
0000    ; DEC assumes  no  responsibility  for  the use or  reliability of its
0000    ; software on equipment which is not supplied by DEC.
0000    ;
0000
0000    ;++
0000    ; Facility:       VAX Architecture Diagnostic.
0000    ;
0000    ; Abstract:       This module does a quick test of main memory for the VAX 11/730
0000    ;                 CPU. First memory is sized and compared against the memory
0000    ;                 size stored in CSR2 by the micro code and then a march test is
0000    ;                 done on all existing memory above that which is allocated to
0000    ;                 the Diagnostic Supervisor or this diagnostic.  Any gaps found
0000    ;                 in memory will be reported. Two parameters will be implemented
0000    ;                 in the P_table: one to enable or disable single-bit error re-
0000    ;                 porting and the other to enter the expected memory size. An en-
0000    ;                 try of zero in the latter invokes self-sizing.
0000    ;
0000    ; Environment:    VAX Diagnostic Supervisor.
0000    ;
0000    ; Author:         Rich Lewis      7-Jly-81        Version 1.0
0000    ;
0000    ; Modified by:    Kevin Martin    9-Nov-82        Version 1.1
0000    ;         01      Added $Ds_Break in test 1 for APT.
0000    ;
0000    ;                 Tai-Chun Pan    01-Apr-83       Version 1.2
0000    ;
0000    ;                 Added quick flag on Test 7(TU58). If quick flag is set
0000    ;                 will skip subtest 4 through subtest 11.  Added event flag 3.
0000    ;                 If event flag 3 is set, will override protection,
0000    ;                 i.e., go ahead and write on tape.  If run APT & event flag 3
0000    ;                 is clear & tape is not scratch, will report an error.
0000    ;                 Modified Unibus sizer on Test 8 & 9. make test run faster.
0000    ;
0000    ;
0000    ;                 Tai-Chun Pan    03-Aug-83       Version 1.3
0000    ;
0000    ;                 fixed bugs on TEST 7 and error summary routine call when
```

```
                          0000     58 ;                      running under APT.
                          0000     59 ;
                          0000     60 ;--
```

```
                 0000     62          .SBTTL  DECLARATIONS
                 0000     63          .LIST   MEB
                 0000     64          .NLIST  CND
             00000000     65          .PSECT  ENKAXI, PAGE, NOWRT
                 0000     66          .LIBRARY        "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                 0000     67          $DS_BGNMOD      CEP_REPAIR, TN=10
                 0000        ;;;      Macro-32 Diagnostic macro library Version 6.10 'DIAG.MLB (137)"
                 0000     68
                 0000     69 ;
                 0000     70 ; Include files:
                 0000     71 ;
                 0000     72
                 0000     73          .LIBRARY        "ENKAX"         ; CPU Cluster Exerciser library.
                 0000     74
                 0000     78
                 0000     79          $DS_SCBDEF
                 0000     80          $DS_DSADEF
                 0000     81          $DS_DSDEF
                 0000     82          $DS_PARDEF
                 0000     83          $DS_PSLDEF
                 0000     84          $DS_ERRDEF
                 0000     85          $DS_DSSDEF
                 0000     86          $DS_HPODEF
                 0000     87          KA_DEF
                 0000     88          ENKAX_SECDEF
                 0000     89
                 0000     90 ;
                 0000     91 ; Own storage:
                 0000     92 ;
                 0000     93
        00000000 0000     94 L_SIZE_CSR:      .LONG                   ; size found in CSR 3
        00000000 0004     95 L_SAVE_CSR3:     .LONG                   ; location to save contents of CSR3
        00000000 0008     96 L_SIZE_ACTL:     .LONG                   ; size found by this program
        00000000 000C     97 L_SIZE_PTBL:     .LONG                   ; size in bytes from p table
        00000000 0010     98 M_MAP_BIT:       .LONG                   ; memory map bit mask
        00000000 0014     99 V_MAP_BIT:       .LONG                   ; memory map bit field
        00080000' 0018   100 L_INCR:          .LONG   L_512K          ; memory size increment
        00000013 001C    101 L_V_SIZE:        .LONG   19              ; field size of L_INCR
        00000000 0020    102 L_MAP_ACTL:      .LONG                   ; actual memory map
        00000000 0024    103 L_RTRN_ADR:      .LONG                   ; return address for mach check service
              00 0028    104 B_FLAGS:         .BYTE                   ; flag byte
                 0029    105
        00000001 0029    106 V_UNXP_FLAG      =1                      ; set after unexpected machine check
        00000002 0029    107 M_UNXP_FLAG      =1@1
        00000003 0029    108 V_MEM_ERR_FLAG   =3                      ; set to indicate error in memory
        00000008 0029    109 M_MEM_ERR_FLAG   =1@3
        00000018 0029    110 V_SB_ERR         =24                     ; report single-bit errors flag
        01000000 0029    111 M_SB_ERR         =1@24
        00000018 0029    112 V_CHIP_SIZE      =24                     ; memory size bit in CSR2
        01000000 0029    113 M_CHIP_SIZE      =1@24
        02000000 0029    114 M_DSABL_ECC      =1@25                   ; disable ECC bit in Memory CSR 1
                 0029    115
        00500000 0029    116 A_MEM_LIM        =^X500000               ; limit of physical address space
        00F20008 0029    117 A_MEM_CSR3       =^XF20008               ; location of CSR3
        00F20004 0029    118 A_MEM_CSR1       =^XF20004               ; location af CSR1
        00020000 0029    119 L_128K           =^X20000                ; 128k
        00080000 0029    120 L_512K           =^X80000                ; 512k
```

```
                                0029    121
                                0029    122
```

```
                                     0029   127 .SBTTL  ERROR MESSAGES
                                     0029   128
                                     0029   129 ;--------------------------------------------------------------------
                                     0029   130 T_NO_KA730:
69 76 65 64 20 6F 4E 20 20 2F 21 00' 0029   131          .ASCIC  "!/  No devices of type KA730 selected.  Exiting test."
20 65 70 79 74 20 66 6F 20 73 65 63  0035
74 63 65 6C 65 73 20 30 33 37 41 4B  0041
67 6E 69 74 69 78 45 20 20 2E 64 65  004D
                  2E 74 73 65 74 20  0059
                                 35  0029
                                     005F   132 ;--------------------------------------------------------------------
                                     005F   133 T_SIZ_ERR:
20 67 6E 69 74 70 6D 65 74 74 41 00' 005F   134          .ASCIC  "Attempting to SIZE memory."
6F 6D 65 6D 20 45 5A 49 53 20 6F 74  006B
                              2E 79 72  0077
                                 1A  005F
                                     007A   135 ;--------------------------------------------------------------------
                                     007A   136 T_DPATH_ERR:
20 67 6E 69 74 70 6D 65 74 74 41 00' 007A   137          .ASCIC  "Attempting to test DATA PATH."
41 54 41 44 20 74 73 65 74 20 6F 74  0086
                  2E 48 54 41 50 20  0092
                                 1D  007A
                                     0098   138 ;--------------------------------------------------------------------
                                     0098   139 T_MARCH_ERR:
20 67 6E 69 74 70 6D 65 74 74 41 00' 0098   140          .ASCIC  "Attempting a MEMORY MARCH test."
52 41 4D 20 59 52 4F 4D 45 4D 20 61  00A4
                  2E 74 73 65 74 20 48 43  00B0
                                 1F  0098
                                     00B8   141 ;--------------------------------------------------------------------
                                     00B8   142 T_NO_MEM_TST:
20 79 72 6F 6D 65 6D 20 6F 4E 20 00' 00B8   143          .ASCIC  " No memory found above supervisor.  Exiting Test.!/"
20 65 76 6F 62 61 20 64 6E 75 6F 66  00C4
20 2E 72 6F 73 69 76 72 65 70 75 73  00D0
73 65 54 20 67 6E 69 74 69 78 45 20  00DC
                        2F 21 2E 74  00E8
                                 33  00B8
                                     00EC   144 ;--------------------------------------------------------------------
                                     00EC   145 T_UNXP_MC_ERR:
63 65 70 78 65 6E 75 20 6E 41 20 00' 00EC   146          .ASCIC  " An unexpected machine check occurred with this logout:!/"
20 65 6E 69 68 63 61 6D 20 64 65 74  00F8
72 72 75 63 63 6F 20 6B 63 65 68 63  0104
73 69 68 74 20 68 74 69 77 20 64 65  0110
   2F 21 3A 74 75 6F 67 6F 6C 20  011C
                                 39  00EC
                                     0126   147 ;--------------------------------------------------------------------
                                     0126   148 T_SIZE_1_ERR:
6E 75 6F 66 20 72 6F 72 72 45 20 00' 0126   149          .ASCIC  " Error found in comparing maps and/or sizes: !/"-
69 72 61 70 6D 6F 63 20 6E 69 20 64  0132
2F 64 6E 61 20 73 70 61 6D 20 67 6E  013E
2F 21 20 3A 73 65 7A 69 73 20 72 6F  014A
65 4D 20 6D 6F 72 66 20 70 61 4D 09  0156
21 09 3A 33 52 53 43 20 79 72 6F 6D  0162
                  2F 21 20 57 58  016E
                                     0173   150                         "       Map from Memory CSR3:   !XW !/"-
3A 70 61 6D 20 6C 61 75 74 63 41 09  0173   151                         "       Actual map:             !XW !/"-
            2F 21 20 57 58 21 09 09  017F
4D 20 6D 6F 72 66 20 65 7A 69 53 09  0187   152                         "       Size from Memory CSR3:  !UL  kbytes!/"-
```

```
09 3A 33 52 53 43 20 79 72 6F 6D 65   0193
21 73 65 74 79 62 6B 20 20 4C 55 21   019F
                                 2F   01AB
70 20 6D 6F 72 66 20 65 7A 69 53 09   01AC    153                 "       Size from p table:     !UL  kbytes!/"-
20 4C 55 21 09 3A 65 6C 62 61 74 20   01B8
         2F 21 73 65 74 79 62 6B 20   01C4
65 7A 69 73 20 6C 61 75 74 63 41 09   01CD    154                 "       Actual size:           !UL  kbytes!/"
74 79 62 6B 20 20 4C 55 21 09 09 3A   01D9
                        2F 21 73 65   01E5
                                 C2   0126
                                      01E9    155 ;----------------------------------------------------------------------
                                      01E9    156 T_SIZE_2_ERR:
6E 75 6F 66 20 72 6F 72 72 45 20 00'  01E9    157         .ASCIC  " Error found in comparing maps and/or sizes: !/"-
69 72 61 70 6D 6F 63 20 6E 69 20 64   01F5
2F 64 6E 61 20 73 70 61 6D 20 67 6E   0201
2F 21 20 3A 73 65 7A 69 73 20 72 6F   020D
65 4D 20 6D 6F 72 66 20 70 61 4D 09   0219    158                 "       Map from Memory CSR3:  !XW !/"-
21 09 3A 33 52 53 43 20 79 72 6F 6D   0225
                     2F 21 20 57 58   0231
3A 70 61 6D 20 6C 61 75 74 63 41 09   0236    159                 "       Actual map:            !XW !/"-
            2F 21 20 57 58 21 09 09   0242
4D 20 6D 6F 72 66 20 65 7A 69 53 09   024A    160                 "       Size from Memory CSR3: !UL  kbytes!/"-
09 3A 33 52 53 43 20 79 72 6F 6D 65   0256
21 73 65 74 79 62 6B 20 20 4C 55 21   0262
                                 2F   026E
65 7A 69 73 20 6C 61 75 74 63 41 09   026F    161                 "       Actual size:           !UL  kbytes!/"
74 79 62 6B 20 20 4C 55 21 09 09 3A   027B
                        2F 21 73 65   0287
                                 A1   01E9
                                      028B    162 ;----------------------------------------------------------------------
                                      028B    163 T_MEM_ERR:
6E 75 6F 66 20 72 6F 72 72 45 20 00'  028B    164         .ASCIC  " Error found in data at location:!XL.!/"-
74 61 20 61 74 61 64 20 6E 69 20 64   0297
58 21 3A 6E 6F 69 74 61 63 6F 6C 20   02A3
                        2F 21 2E 4C   02AF
58 21 3A 64 65 74 63 65 70 78 45 20   02B3    165                 " Expected:!XL  Actual:!XL             XOR:!XL!/"
4C 58 21 3A 6C 61 75 74 63 41 09 4C   02BF
   2F 21 4C 58 21 3A 52 4F 58 09 09   02CB
                                 4A   028B
                                      02D6    166 ;----------------------------------------------------------------------
                                      02D6    167 T_MEM_MAP:
4D 20 6C 61 75 74 63 41 20 2F 21 00'  02D6    168         .ASCIC  "!/ Actual MEMORY MAP, each bit set represents !UL kbytes:"-
65 20 2C 50 41 4D 20 59 52 4F 4D 45   02E2
20 74 65 73 20 74 69 62 20 68 63 61   02EE
21 20 73 74 6E 65 73 65 72 70 65 72   02FA
      3A 73 65 74 79 62 6B 20 4C 55   0306
75 74 63 41 20 2F 21 20 4C 58 21 09   0310    169                 "       !XL !/ Actual size, in kbytes:  !UL !/"
20 6E 69 20 2C 65 7A 69 73 20 6C 61   031C
20 4C 55 21 09 3A 73 65 74 79 62 6B   0328
                              2F 21   0334
                                 5F   02D6
                                      0336    170 ;----------------------------------------------------------------------
                                      0336    171
```

```
                   0336   173 .SBTTL  DATA TABLES
                   0336   174
                   0336   175 ; Data table for DATA PATH subtest (2)
                   0336   176
         00000000  0336   177 TABLE_1:          .LONG    ^X0              ; float one in field in zeroes
         00000001  033A   178                   .LONG    ^X1
         00000002  033E   179                   .LONG    ^X2
         00000004  0342   180                   .LONG    ^X4
         00000008  0346   181                   .LONG    ^X8
         00000010  034A   182                   .LONG    ^X10
         00000020  034E   183                   .LONG    ^X20
         00000040  0352   184                   .LONG    ^X40
         00000080  0356   185                   .LONG    ^X80
         00000100  035A   186                   .LONG    ^X100
         00000200  035E   187                   .LONG    ^X200
         00000400  0362   188                   .LONG    ^X400
         00000800  0366   189                   .LONG    ^X800
         00001000  036A   190                   .LONG    ^X1000
         00002000  036E   191                   .LONG    ^X2000
         00004000  0372   192                   .LONG    ^X4000
         00008000  0376   193                   .LONG    ^X8000
         00010000  037A   194                   .LONG    ^X10000
         00020000  037E   195                   .LONG    ^X20000
         00040000  0382   196                   .LONG    ^X40000
         00080000  0386   197                   .LONG    ^X80000
         00100000  038A   198                   .LONG    ^X100000
         00200000  038E   199                   .LONG    ^X200000
         00400000  0392   200                   .LONG    ^X400000
         00800000  0396   201                   .LONG    ^X800000
         01000000  039A   202                   .LONG    ^X1000000
         02000000  039E   203                   .LONG    ^X2000000
         04000000  03A2   204                   .LONG    ^X4000000
         08000000  03A6   205                   .LONG    ^X8000000
         10000000  03AA   206                   .LONG    ^X10000000
         20000000  03AE   207                   .LONG    ^X20000000
         40000000  03B2   208                   .LONG    ^X40000000
         80000000  03B6   209                   .LONG    ^X80000000
         FFFFFFFF  03BA   210                   .LONG    ^XFFFFFFFF       ; float zero in field of ones
         FFFFFFFE  03BE   211                   .LONG    ^XFFFFFFFE
         FFFFFFFD  03C2   212                   .LONG    ^XFFFFFFFD
         FFFFFFFB  03C6   213                   .LONG    ^XFFFFFFFB
         FFFFFFF7  03CA   214                   .LONG    ^XFFFFFFF7
         FFFFFFEF  03CE   215                   .LONG    ^XFFFFFFEF
         FFFFFFDF  03D2   216                   .LONG    ^XFFFFFFDF
         FFFFFFBF  03D6   217                   .LONG    ^XFFFFFFBF
         FFFFFF7F  03DA   218                   .LONG    ^XFFFFFF7F
         FFFFFEFF  03DE   219                   .LONG    ^XFFFFFEFF
         FFFFFDFF  03E2   220                   .LONG    ^XFFFFFDFF
         FFFFFBFF  03E6   221                   .LONG    ^XFFFFFBFF
         FFFFF7FF  03EA   222                   .LONG    ^XFFFFF7FF
         FFFFEFFF  03EE   223                   .LONG    ^XFFFFEFFF
         FFFFDFFF  03F2   224                   .LONG    ^XFFFFDFFF
         FFFFBFFF  03F6   225                   .LONG    ^XFFFFBFFF
         FFFF7FFF  03FA   226                   .LONG    ^XFFFF7FFF
         FFFEFFFF  03FE   227                   .LONG    ^XFFFEFFFF
         FFFDFFFF  0402   228                   .LONG    ^XFFFDFFFF
         FFFBFFFF  0406   229                   .LONG    ^XFFFBFFFF
```

```
                              FFF7FFFF  040A   230                      .LONG    ^XFFF7FFFF
                              FFFEFFFF  040E   231                      .LONG    ^XFFFEFFFF
                              FFFDFFFF  0412   232                      .LONG    ^XFFFDFFFF
                              FFFBFFFF  0416   233                      .LONG    ^XFFFBFFFF
                              FFF7FFFF  041A   234                      .LONG    ^XFFF7FFFF
                              FFEFFFFF  041E   235                      .LONG    ^XFFEFFFFF
                              FFDFFFFF  0422   236                      .LONG    ^XFFDFFFFF
                              FFBFFFFF  0426   237                      .LONG    ^XFFBFFFFF
                              F7FFFFFF  042A   238                      .LONG    ^XF7FFFFFF
                              EFFFFFFF  042E   239                      .LONG    ^XEFFFFFFF
                              DFFFFFFF  0432   240                      .LONG    ^XDFFFFFFF
                              BFFFFFFF  0436   241                      .LONG    ^XBFFFFFFF
                              7FFFFFFF  043A   242                      .LONG    ^X7FFFFFFF
                              00000000  043E   243                      .LONG    ^X0
                                        0442   244
                                        0442   245
                                        0442   246
                                        0442   247
.SBTTL  ERROR REPORTING ROUTINES
                                        0442   248
                                        0442   249
                                        0442   250 ; This entended error reporting routine is called to report data errors found
                                        0442   251 ; in memory or an unexpected machine check occurrence.
                                        0442   252
                                        0442   253 ERROR_MESSAGE:
                                        0442   254
                                        0442   255         $DS_BGNMESSAGE
                                  0000  0442                    .WORD    ^M<>                     ; ENTRY MASK
                  1C FBDF CF   01   E0  0444   256 5$:     BBS      #V_UNXP_FLAG,B_FLAGS,10$           ; br = unexpected mach ck
                  59   14 AC   66   CD  044A   257         XORL3    (R6),ERR$_P1(AP),R9                ; load XOR
                                        044F   258         $DS_PRINTX_S     FORMAT=T_MEM_ERR,-         ; report data error
                                        044F   259                          P1=R6,-                    ; location
                                        044F   260                          P2=ERR$_P1(AP),-           ; expected value
                                        044F   261                          P3=(R6),-                  ; actual value
                                        044F   262                          P4=R9                      ; XOR
                               59   DD  044F                    PUSHL    R9
                               66   DD  0451                    PUSHL    (R6)
                            14 AC   DD  0453                    PUSHL    ERR$_P1(AP)
                               56   DD  0456                    PUSHL    R6
                          FE2F CF   9F  0458                    PUSHAB   T_MEM_ERR
                  000100E8 9F  05   FB  045C                    CALLS    #$$N, @#DS$PRINTX
                             0016   31  0463   263         BRW      20$                                ; done
                                        0466   264 10$:    $DS_PRINTX_S     FORMAT=T_UNXP_MC_ERR       ; report unexp. mach. check
                          FC82 CF   9F  0466                    PUSHAB   T_UNXP_MC_ERR
                  000100E8 9F  01   FB  046A                    CALLS    #$$N, @#DS$PRINTX
                                        0471   265         $DS_PRINTSIG_G   ARGPTR=@A_MCHK_BUFFER     ; print logout stack
         00010100 9F    00000000'FF   FA  0471                    CALLG    @A_MCHK_BUFFER, @#DS$PRINTSIG
                                        047C   266 20$.
                                        047C   267         $DS_ENDMESSAGE
                                   04   047C                    RET                               ; RETURN TO DIAGNOSTIC SUPERVISOR
                                        047D   268
                                        047D   269
                                        047D   270 ; This extended error reporting routine is called to report any discrepancy
                                        047D   271 ; found between the map in Memory CSR 3 and that generated in the sizing rou-
                                        047D   272 ; tine or between the size entered in the hardware p table and that generated
                                        047D   273 ; in the sizing routine.  If the size was not entered in the p table, it will,
                                        047D   274 ; of course, not be printed.  Sizes are reported in kbytes.
```

```
047D   275
```

```
                                 047D   276 SIZ_ERR:
                                 047D   277
                                 047D   278         $DS_BGNMESSAGE
                           0000  047D                       .WORD   ^M<>                    ; ENTRY MASK
                                 047F   279 ;
                                 047F   280 ; Convert byte sizes to kbytes.
                                 047F   281 ;
   52   FB78 CF   00000400 8F  C7  047F   282         DIVL3           #^X400,L_SIZE_CSR,R2    ; convert from CSR
   54   FB76 CF   00000400 8F  C7  0489   283         DIVL3           #^X400,L_SIZE_ACTL,R4   ; convert actual
                                 0493   284 ;
                                 0493   285 ; Determine which error message dependent upon whether size entered in P table.
                                 0493   286 ;
               00000000'EF     D5  0493   287         TSTL            L_KSIZE_PTBL                    ; size entered in p table?
                        20     13  0499   288         BEQL            5$                              ; br = size not entered
                                 049B   289 ;
                                 049B   290 ; This message if size entered in P table
                                 049B   291 ;
                                 049B   292         $DS_PRINTB_S    FORMAT=T_SIZE_1_ERR,-
                                 049B   293                         P1=L_SAVE_CSR3,-                ; map from CSR 3
                                 049B   294                         P2=L_MAP_ACTL,-                 ; actual map
                                 049B   295                         P3=R2,-                         ; size from CSR
                                 049B   296                         P4=L_KSIZE_PTBL,-               ; size from P table
                                 049B   297                         P5=R4                           ; actual size
                        54     DD  049B                       PUSHL   R4
               00000000'EF     DD  049D                       PUSHL   L_KSIZE_PTBL
                        52     DD  04A3                       PUSHL   R2
                   FB77 CF     DD  04A5                       PUSHL   L_MAP_ACTL
                   FB57 CF     DD  04A9                       PUSHL   L_SAVE_CSR3
                   FC75 CF     9F  04AD                       PUSHAB  T_SIZE_1_ERR
          000100E0 9F   06     FB  04B1                       CALLS   #$$N, @#DS$PRINTB
                      0017     31  04B8   298         BRW             10$
                                 04BB   299 ;
                                 04BB   300 ; This message if size not entered in P table
                                 04BB   301 ;
                                 04BB   302 5$:     $DS_PRINTB_S    FORMAT=T_SIZE_2_ERR,-
                                 04BB   303                         P1=L_SAVE_CSR3,-                ; map from CSR 3
                                 04BB   304                         P2=L_MAP_ACTL,-                 ; actual map
                                 04BB   305                         P3=R2,-                         ; size from CSR 3
                                 04BB   306                         P4=R4                           ; actual size
                        54     DD  04BB                       PUSHL   R4
                        52     DD  04BD                       PUSHL   R2
                   FB5D CF     DD  04BF                       PUSHL   L_MAP_ACTL
                   FB3D CF     DD  04C3                       PUSHL   L_SAVE_CSR3
                   FD1E CF     9F  04C7                       PUSHAB  T_SIZE_2_ERR
          000100E0 9F   05     FB  04CB                       CALLS   #$$N, @#DS$PRINTB
                                 04D2   307 10$:
                                 04D2   308         $DS_ENDMESSAGE
                        04         04D2                       RET                             ; RETURN TO DIAGNOSTIC SUPERVISOR
                                 04D3   309
```

```
                              04D3  .SBTTL  SUBROUTINES
                              04D3
                              04D3  ; This subroutine sizes existing memory by attempting to read locations
                              04D3  ; on successive 128- or 512 kbyte boundaries, creating a memory map with
                              04D3  ; a bit set for each segment present.  The size in bytes is also calculated.
                              04D3
                              04D3  MEM_SIZE:
                              04D3
         FB38 CF    01    D0  04D3          MOVL    #1,M_MAP_BIT                  ; initialize map mask
              FB2C CF     D4  04D8          CLRL    L_SIZE_ACTL                   ; initialize actual size
              FB40 CF     D4  04DC          CLRL    L_MAP_ACTL                    ; initialize actual map
                   56     D4  04E0          CLRL    R6                            ; initialize index
                              04E2
                              04E2  1$:     $DS_PROBE_S     UNIT=KA_UNIT_NO,-     ; probe 1st byte in segment
                              04E2                          LENGTH=#1,-
                              04E2                          ADDRESS=(R6)
         00000000'EF      DD  04E2                  PUSHL   KA_UNIT_NO
                   01     DD  04E8                  PUSHL   #1
                   66     9F  04EA                  PUSHAB  (R6)
      000101A0 9F   03    FB  04EC                  CALLS   #3, @#DS$PROBE
                              04F3          $DS_BERROR      5$                    ; br = NXM probed
                   50     DD  04F3                  PUSHL   R0
                   01     DD  04F5                  PUSHL   #$ER
         00000000'8F      DD  04F7                  PUSHL   #DS$K_BERROR
      000100A8 9F   03    FB  04FD                  CALLS   #3, @#DS$BRANCH
                0E 50     E9  0504                  BLBC    R0, 5$
      FB12 CF  FB05 CF    C8  0507          BISL2           M_MAP_BIT,L_MAP_ACTL  ; set bit in actual map
      FAF3 CF  FB06 CF    C0  050E          ADDL2           L_INCR,L_SIZE_ACTL    ; increment actual size
                              0515
   FAF3 CF  FAF6 CF   01  78  0515  5$:     ASHL    #1,M_MAP_BIT,M_MAP_BIT        ; shift mask
B9 56  FAF2 CF 00500000 8F F1 051D          ACBL    #A_MEM_LIM,L_INCR,R6,1$       ; incr index, br = not done
                          FF  0527
                              0529
                   05         0529          RSB                                   ; return
                              052A
                              052A
                              052A  ; This interrupt-service routine sets NXM flag to indicate that a NXM machine
                              052A  ; check has occurred or UNXP flag if any unexpected machine check occurred.
                              052A  ; The machine check logout stack is also saved in the machine check buffer.
                              052A
                              052A              .ALIGN  LONG
                              052C  MCHK_SERVICE:
                              052C
      00000000'8F   00    DA  052C          MTPR    #0,#PR$_MCESR                 ; clear pending mc exception
      53  00000000'EF     D0  0533          MOVL    A_MCHK_BUFFER,R3              ; load buffer address
                83  06    D0  053A          MOVL    #6,(R3)+                      ; load count for printsig
      83  00660088'EF     DE  053D          MOVAL   DS$_MCHK,(R3)+                ; load type of exception
                54  6E    D0  0544          MOVL    (SP),R4                       ; load argument byte count
       54   54   FE 8F    78  0547          ASHL    #-2,R4,R4                     ; convert to longword count
                54  03    C0  054C          ADDL2   #3,R4                         ; include PC,PSL,TYPE in count
                83  8E    D0  054F  1$:     MOVL    (SP)+,(R3)+                   ; pop longword into buffer
                    54    D7  0552          DECL    R4                            ; count longword
                    F9    12  0554          BNEQ    1$                            ; br = not done
      52  00000000'EF     D0  0556          MOVL    A_MCHK_BUFFER,R2              ; load buffer address
          FAC6 CF   02    C8  055D  5$:     BISL2   #M_UNXP_FLAG,B_FLAGS          ; set UNXP flag
               FABE DF    17  0562  10$:    JMP     @L_RTRN_ADR
                              0566
                0566   358          $DS_PAGE
                0566   359
```

```
                      0566              .SBTTL  TEST 10:  Memory
                  00000000                      .PSECT  TEST_010, PAGE, NOWRT
                      000C
                      000C   362 ; ++
                      000C   363 ; Test description:
                      000C   364 ;
                      000C   365 ;                  This test does a quick verify of main memory for the VAX 11/730
                      000C   366 ;                  CPU. First memory is sized and compared against the memory
                      000C   367 ;                  size stored in CSR2 and the P_table entry. The data path is
                      000C   368 ;                  checked and a march test is performed on all sized memory above
                      000C   369 ;                  the first 128K bytes excluding that which may be allocated to
                      000C   370 ;                  the diagnostic supervisor. Single bit errors are reported if
                      000C   371 ;                  requested in the P_table entry.
                      000C   372 ;
                      000C   373 ;--
                      000C   374
                      000C   375        $DS_BGNTEST     <MEM,DEFAULT,ALL>
                      000C       DATA_010:
         00000000     000C                      .LONG   0                ; TEST ARGUMENT TABLE TERMINATOR
                      0010       TEST_010::
             0000     0010                      .WORD   ^M<>             ; ENTRY MASK
                      0012   376
     00000000'EF   D5 0012   377        TSTL    KA_PTABLE                ; CPU selected?
              10   18 0018   378        BGEQ    5$                       ; br = CPU selected
                      001A   379        $DS_PRINTF_S    FORMAT=T_NO_KA730 ; print exit warning
     00000029'EF   9F 001A                      PUSHAB  T_NO_KA730
  000100F0 9F   01 FB 0020                      CALLS   #$$N, @#DS$PRINTF
                      0027   380        $DS_EXIT        TEST             ; exit test
            0388   31 0027                      BRW     TEST_010_X       ; EXIT TEST 10
                      002A   381 5$:
                      002A   382        $DS_PAGE
```

```
                                   002A            .SBTTL  SUBTEST 10.1:  Memory Size
                                   002A      ;+
                                   002A      ; Subtest description:
                                   002A      ;
                                   002A      ;        This subtest sizes memory and then compares memory found
                                   002A      ;        to the size stored in memory CSR2.
                                   002A      ;
                                   002A      ; Subtest steps:
                                   002A      ;
                                   002A      ;        SUBTEST Memory Size
                                   002A      ;        :  Get expected size from ka p table
                                   002A      ;        :  Read memory CSR3 (memory found at power up by micro code)
                                   002A      ;        :  Size memory
                                   002A      ;        :  Compare two sizes
                                   002A      ;        :  IF size is not the same
                                   002A      ;        :  : THEN
                                   002A      ;        :  :  Report Memory size error
                                   002A      ;        :  ENDIF
                                   002A      ;        ENDSUBTEST Memory Size
                                   002A      ;
                                   002A      ;-
                                   002A
                                   002A
                                   002A            $DS_BGNSUB
                                   002A      T10_S1::
    00010030 9F   00000000'EF   FA 002A                    CALLG   $S$, @#DS$BGNSUB
                  00000028'EF   94 0035            CLRB    B_FLAGS                         ; init flag byte
    00000004'EF   00F20008 9F   D0 003B            MOVL    @#A_MEM_CSR3,L_SAVE_CSR3        ; save CSR3 contents
0000000C'EF   00000000'EF   0A  78 0046            ASHL    #10,L_KSIZE_PTBL,L_SIZE_PTBL    ; convert kbytes to bytes
                                   0052      ;
                                   0052      ; Calculate expected size from Memory CSR3
                                   0052      ;
                  00000000'EF   D4 0052            CLRL    L_SIZE_CSR                      ; init memory size
             55   00F20008 9F   D0 0058            MOVL    @#A_MEM_CSR3,R5                 ; read CSR3
                     12 55  18  E0 005F            BBS     #V_CHIP_SIZE,R5,1$              ; br = 64k chips
    00000018'EF   00020000 8F   D0 0063            MOVL    #L_128K,L_INCR                  ; adjust incr for 16k chips
                  0000001C'EF 11 D0 006E           MOVL    #17,L_V_SIZE                    ; load field size for 16k chips
             55   FFFF0000 8F   CA 0075      1$:   BICL2   #^XFFFF0000,R5                  ; Clear don't care bits
                            55  D5 007C      2$:   TSTL    R5                              ; any bits set?
                            12  13 007E            BEQL    3$                              ; br = no bits set
    00000000'EF   00000018'EF   C0 0080            ADDL2   L_INCR,L_SIZE_CSR               ; incr size
              55    55    FF 8F 78 008B            ASHL    #-1,R5,R5                       ; shift map right
                            EA  11 0090            BRB     2$                              ; br to beginning of loop
                                   0092      ;
                                   0092      ; Size memory and print memory map
                                   0092      ;
                  000004D3'EF   16 0092      3$:   JSB             MEM_SIZE                ; go size memory
52  00000008'EF   00000400 8F   C7 0098            DIVL3           #^X400,L_SIZE_ACTL,R2   ; convert to kbytes
53  00000018'EF   00000400 8F   C7 00A4            DIVL3           #^X400,L_INCR,R3        ; convert to kbytes
                                   00B0            $DS_PRINTF_S    FORMAT=T_MEM_MAP,-      ; print memory map
                                   00B0                            P1=R3,-                 ; memory increment
                                   00B0                            P2=L_MAP_ACTL,-         ; actual map
                                   00B0                            P3=R2                   ; size in kbytes
                            52  DD 00B0                    PUSHL   R2
                  00000020'EF   DD 00B2                    PUSHL   L_MAP_ACTL
                            53  DD 00B8                    PUSHL   R3
                  000002D6'EF   9F 00BA                    PUSHAB  T_MEM_MAP
```

```
ZZ-
ENK
Cro

SYM
---
$$$
$$A
$$E
$$M

$$N

$$S

$$T
$EN
$ER

$MO
$S$

$ST

$TN

ALL
A_F

A_M
A_M
A_M
A_M
BAS
BIT

B_F

CEP
CEP
CPU
CPU
CPU
DAT
DEF
DS$
DS$
DS$
```

```
        000100F0 9F     04     FB  00C0                          CALLS   #$$N, @#DS$PRINTF
                                   00C7     435 ;
                                   00C7     436 ; Check for size or map errors, report if any
                                   00C7     437 ;
    00000004'EF     00000020'EF    B1  00C7     438              CMPW    L_MAP_ACTL,L_SAVE_CSR3          ; compare maps
                            15     12  00D2     439              BNEQ    4$                              ; br = no error
                    0000000C'EF    D5  00D4     440              TSTL    L_SIZE_PTBL                     ; size entered in ka p table?
                            28     13  00DA     441              BEQL    10$                             ; br = size not entered
    00000008'EF     0000000C'EF    D1  00DC     442              CMPL    L_SIZE_PTBL,L_SIZE_ACTL         ; compare sizes
                            1B     13  00E7     443              BEQL    10$                             ; br = no error
                                   00E9     444
                                   00E9     445 4$:      $DS_ERRHARD_S   UNIT=KA_UNIT_NO,-
                                   00E9     446                          MSGADR=T_SIZ_ERR,-
                                   00E9     447                          PRLINK=SIZ_ERR
                0000047D'EF    DF  00E9                          PUSHAL  SIZ_ERR
                0000005F'EF    DF  00EF                          PUSHAL  T_SIZ_ERR
                00000000'EF    DD  00F5                          PUSHL   KA_UNIT_NO
                         01    DD  00FB                          PUSHL   #$ER
                                   00FD         ;;; TEST 10, SUBTEST 1, ERROR 1
        000100D0 9F     04     FB  00FD                          CALLS   #$$M, @#DS$ERRHARD
                                   0104     448 10$:
                                   0104     449          $DS_ENDSUB
                                   0104         T10_S1_X:
    00010038 9F     00000000'EF    FA  0104                          CALLG   $S$, @#DS$ENDSUB
                                   010F     450          $DS_PAGE
```

```
                                    010F            .SBTTL  SUBTEST 10.2:  Data Path
                                    010F   453 ;+
                                    010F   454 ; Subtest description:
                                    010F   455 ;
                                    010F   456 ;        This subtest checks the data path for stuck at one, stuck at zero
                                    010F   457 ;        and shorted data lines. This is accomplished by floating a one and
                                    010F   458 ;        a zero through the data. If an error is detected it is reported with
                                    010F   459 ;        information describing the nature of the error.
                                    010F   460 ;
                                    010F   461 ;
                                    010F   462 ; Subtest steps:
                                    010F   463 ;
                                    010F   464 ;        SUBTEST Data Path
                                    010F   465 ;        :  IF REPORT SB ERRORS
                                    010F   466 ;        :  :  THEN SET Memory CSR1 Disable ECC
                                    010F   467 ;        :  ENDIF
                                    010F   468 ;        :  Initialize data pattern
                                    010F   469 ;        :  REPEAT
                                    010F   470 ;        :  :  Write pattern
                                    010F   471 ;        :  :  Read pattern
                                    010F   472 ;        :  :  IF pattern incorrect
                                    010F   473 ;        :  :  :  THEN
                                    010F   474 ;        :  :  :  Report error
                                    010F   475 ;        :  :  ENDIF
                                    010F   476 ;        :  :  Update pattern
                                    010F   477 ;        :  : UNTIL all patterns done
                                    010F   478 ;        :  ENDREPEAT
                                    010F   479 ;        ENDSUBTEST Data Path
                                    010F   480 ;
                                    010F   481 ;-
                                    010F   482
                                    010F   483
                                    010F   484          $DS_BGNSUB
                                    010F       T10_S2::
00010030 9F   0000000C'EF     FA    010F                        CALLG   $S$, @#DS$BGNSUB
      0B 00000000'EF     18   E1    011A   485          BBC     #V_SB_ERR,L_KA_FLAGS,0$          ; br = no SB error report
00F20004 9F   02000000 8F     C8    0122   486          BISL2   #M_DSABL_ECC,@#A_MEM_CSR1        ; disable ECC
                                    012D   487 0$:      $DS_SETVEC_S    VECTOR=#SCB$L_MACHCHK,SRVADR=MCHK_SERVICE
                         00   DD    012D                        PUSHL   #0
              0000052C'EF     DF    012F                        PUSHAL  MCHK_SERVICE
                         04   DD    0135                        PUSHL   #SCB$L_MACHCHK
        00010160 9F      03   FB    0137                        CALLS   #3, @#DS$SETVEC
00000024'EF   0000017D'8F     D0    013E   488          MOVL    #5$,L_RTRN_ADR                         ; load return address
              00000028'EF     94    0149   489          CLRB    B_FLAGS                                ; init flag byte
              00000000'EF     D5    014F   490          TSTL    A_FREE_MEM                             ; memory found above DS?
                         10   12    0155   491          BNEQ    1$                                     ; br = memory above DS
                                    0157   492          $DS_PRINTF_S    T_NO_MEM_TST                   ; print exit warning
              000000B8'EF     9F    0157                        PUSHAB  T_NO_MEM_TST
        000100F0 9F      01   FB    015D                        CALLS   #$$N, @#DS$PRINTF
                                    0164   493          $DS_EXIT        TEST                           ; exit test
                       024B   31    0164                        BRW     TEST_010_X       ; EXIT TEST 10
        56    00000000'EF     D0    0167   494 1$:      MOVL    A_FREE_MEM,R6                          ; load address to check
        57    00000336'EF     DE    016E   495          MOVAL   TABLE_T,R7                             ; load table address
                    66   67   D0    0175   496 3$:      MOVL    (R7),(R6)                              ; load pattern into memory
                    66   67   D1    0178   497          CMPL    (R7),(R6)                              ; check data
                    1D   13         017B   498          BEQL    6$                                     ; br = error
                                    017D   499
```

```
                                     017D     500 5$:      $DS_ERRHARD_S    UNIT=KA_UNIT_NO,-             ; report error
                                     017D     501                           MSGADR=T_DPATH_ERR,-
                                     017D     502                           PRLINK=ERROR_MESSAGE,-
                                     017D     503                           P1=(R7)                       ; expected data
                      67      DD     017D                         PUSHL     (R7)
             00000442'EF      DF     017F                         PUSHAL    ERROR_MESSAGE
             0000007A'EF      DF     0185                         PUSHAL    T_DPATH_ERR
             00000000'EF      DD     018B                         PUSHL     KA_UNIT_NO
                      01      DD     0191                         PUSHL     #$ER
                                     0193         ;;; TEST 10, SUBTEST 2, ERROR 1
     000100D0 9F      05      FB     0193                         CALLS     #$$M, @#DS$ERRHARD
                                     019A     504
                                     019A     505 6$:      $DS_CKLOOP       3$                            ; scope loop at 3$
   00010040 9F     D8 AF      FA     019A                         CALLG     3$, @#DS$CKLOOP
                                     01A2     506
                 57   04      C0     01A2     507          ADDL2   #4,R7                                  ; incr index
                      67      D5     01A5     508          TSTL    (R7)                                   ; done ?
                      CC      12     01A7     509          BNEQ    3$                                     ; br = not done
                                     01A9     510
                                     01A9     511          $DS_CLRVEC_S     VECTOR=#SCB$L_MACHCHK
                      04      DD     01A9                         PUSHL     #SCB$L_MACHCHK
     00010168 9F      01      FB     01AB                         CALLS     #1, @#DS$CLRVEC
                                     01B2     512
                                     01B2     513          $DS_ENDSUB
                                     01B2          T10_S2_X:
 00010038 9F     0000000C'EF      FA     01B2                         CALLG     $S$, @#DS$ENDSUB
                                     01BD     514
                                     01BD     515          $DS_PAGE
```

```
                                  01BD            .SBTTL  SUBTEST 10.3:  Memory March
                                  01BD      ;+
                                  01BD      ; Subtest description:
                                  01BD      ;
                                  01BD      ;       This subtest does a march thru all of memory above that which is
                                  01BD      ;       allocated to the supervisor.  A background pattern of all zeros is
                                  01BD      ;       written into memory.  Starting with location @A_FREE_MEM thru all
                                  01BD      ;       available memory, the following is done.  First, the background pattern
                                  01BD      ;       is checked (i.e., checked for stuck or shorted address lines), then a
                                  01BD      ;       pattern of all ones is written and checked.  A reverse march is then
                                  01BD      ;       executed, starting at the highest usable memory location, checking that
                                  01BD      ;       the old pattern of all ones is still present (again, checking for stuck
                                  01BD      ;       or shorted address lines) and loading a new pattern of all zeroes.  The
                                  01BD      ;       new pattern is also checked and the address is then decremented.  This
                                  01BD      ;       process assures also that there are no stuck data bits at any location.
                                  01BD      ;       If a NXM machine check occurs while accessing expected good memory an
                                  01BD      ;       error is reported.  This test skips over ''holes'' in memory, using the
                                  01BD      ;       map generated in the sizing routine.
                                  01BD      ;
                                  01BD      ;
                                  01BD      ; Subtest steps:
                                  01BD      ;
                                  01BD      ;       SUBTEST Memory March
                                  01BD      ;       :  DO FOR each physical memory location beyond supervisor
                                  01BD      ;       :  :  Clear locations under test
                                  01BD      ;       :  ENDDO
                                  01BD      ;       :  DO FOR each physical memory location beyond supervisor
                                  01BD      ;       :  :  IF data error
                                  01BD      ;       :  :  :  THEN REPORT Error
                                  01BD      ;       :  :  ENDIF
                                  01BD      ;       :  :  SET all bits at location
                                  01BD      ;       :  ENDDO
                                  01BD      ;       :  REVERSE march direction
                                  01BD      ;       :  DO FOR each physical memory location beyond supervisor
                                  01BD      ;       :  :  IF data error
                                  01BD      ;       :  :  :  THEN REPORT error
                                  01BD      ;       :  :  ENDIF
                                  01BD      ;       :  :  CLEAR location
                                  01BD      ;       :  :  IF location not clear
                                  01BD      ;       :  :  :  THEN REPORT Error
                                  01BD      ;       :  :  ENDIF
                                  01BD      ;       :  ENDDO
                                  01BD      ;       ENDSUBTEST Memory March
                                  01BD      ;
                                  01BD      ;-
                                  01BD              $DS_BGNSUB
                                  01BD      T10_S3::
    00010030 9F   00000018'EF  FA 01BD                      CALLG   $S$, @#DS$BGNSUB
                                  01C8
                                  01C8              $DS_SETVEC_S    VECTOR=#SCB$L_MACHCHK,SRVADR=MCHK_SERVICE
                            00 DD 01C8                      PUSHL   #0
                   0000052C'EF DF 01CA                      PUSHAL  MCHK_SERVICE
                            04 DD 01D0                      PUSHL   #SCB$L_MACHCHK
           00010160 9F      03 FB 01D2                      CALLS   #3, @#DS$SETVEC
                   00000028'EF 94 01D9              CLRB    B_FLAGS                         ; init flag byte
              56   00000000'EF D0 01DF              MOVL    A_FREE_MEM,R6                   ; load starting address
00000014'EF   56   00000018'EF C7 01E6              DIVL3   L_INCR,R6,V_MAP_BIT             ; load map bit pointer
```

```
   00000024'EF    00000231'8F   D0  01F2   568          MOVL    #12$,L_RTRN_ADR                     ; load return address for m.c.
                           54   D4  01FD   569          CLRL    R4                                  ; clear R4
                                    01FF   570 ;
                                    01FF   571 ; Clear each location (background pattern)
                                    01FF   572 ;
                           86   D4  01FF   573 0$:      CLRL    (R6)+                               ; clear location
  54    56    0000001C'EF  00   EC  0201   574 5$:      CMPV    #0,L_V_SIZE,R6,R4                   ; on segment boundary?
                           F3   12  020A   575          BNEQ    0$                                  ; br = not on segment boundary
                                    020C   576 10$:     $DS_BREAK                                   ; check for ^C
           00010058 9F     6E   FA  020C                        CALLG   (SP), @#DS$BREAK
                   00000014'EF  D6  0213   577          INCL    V_MAP_BIT                           ; incr map bit pointer
  DA 00000020'EF   00000014'EF  E0  0219   578          BBS     V_MAP_BIT,L_MAP_ACTL,0$             ; br = no hole
        00000008'EF        56   D1  0225   579          CMPL    R6,L_SIZE_ACTL                      ; end of physical memory?
                           DE   19  022C   580          BLSS    10$                                 ; br = not end of memory
                         001E   31  022E   581          BRW     15$                                 ; br around error report
                                    0231   582
                                    0231   583 12$:     $DS_ERRHARD_S   UNIT=KA_UNIT_NO,-           ; returns here from machine ck
                                    0231   584                          MSGADR=T_MARCH_ERR,-
                                    0231   585                          PRLINK=ERROR_MESSAGE
                  00000442'EF   DF  0231                        PUSHAL  ERROR_MESSAGE
                  00000098'EF   DF  0237                        PUSHAL  T_MARCH_ERR
                  00000000'EF   DD  023D                        PUSHL   KA_UNIT_NO
                           01   DD  0243                        PUSHL   #$ER
                                    0245           ;;; TEST 10, SUBTEST 3, ERROR 1
           000100D0 9F     04   FB  0245                        CALLS   #$$M, @#DS$ERRHARD
                         FFB0   31  024C   586          BRW     0$                                  ; continue clearing memory
                                    024F   587 ;
                                    024F   588 ; Forward march, check old data (0s), load new pattern of all 1s, check new
                                    024F   589 ; pattern
                                    024F   590 ;
              56  00000000'EF   D0  024F   591 15$:     MOVL    A_FREE_MEM,R6                       ; load beginning address
              57    FFFFFFFF 8F D0  0256   592          MOVL    #-1,R7                              ; load data pattern of all 1s
00000014'EF   56  00000018'EF   C7  025D   593          DIVL3   L_INCR,R6,V_MAP_BIT                 ; load map bit pointer
                                    0269   594
   00000024'EF    00000278'8F   D0  0269   595 30$:     MOVL    #35$,L_RTRN_ADR                     ; load return address
                           66   D5  0274   596          TSTL    (R6)                                ; check data
                           1D   13  0276   597          BEQL    37$                                 ; br = clear
                                    0278   598
                                    0278   599 35$:     $DS_ERRHARD_S   UNIT=KA_UNIT_NO,-           ; report error
                                    0278   600                          MSGADR=T_MARCH_ERR,-
                                    0278   601                          PRLINK=ERROR_MESSAGE,-
                                    0278   602                          P1=#0                       ; expected data
                           00   DD  0278                        PUSHL   #0
                  00000442'EF   DF  027A                        PUSHAL  ERROR_MESSAGE
                  00000098'EF   DF  0280                        PUSHAL  T_MARCH_ERR
                  00000000'EF   DD  0286                        PUSHL   KA_UNIT_NO
                           02   DD  028C                        PUSHL   #$ER
                                    028E           ;;; TEST 10, SUBTEST 3, ERROR 2
           000100D0 9F     05   FB  028E                        CALLS   #$$M, @#DS$ERRHARD
                                    0295   603
   00000024'EF    000002A8'8F   D0  0295   604 37$:     MOVL    #38$,L_RTRN_ADR                     ; load return address
                  66       57   D0  02A0   605          MOVL    R7,(R6)                             ; load pattern into location
                  66       57   D1  02A3   606          CMPL    R7,(R6)                             ; check new pattern
                           21   13  02A6   607          BEQL    39$                                 ; br = no error
                                    02A8   608
                                    02A8   609 38$:     $DS_ERRHARD_S   UNIT=KA_UNIT_NO,-           ; report error
                                    02A8   610                          MSGADR=T_MARCH_ERR,-
```

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PC
PR
```

```
                                02A8   611                        PRLINK=ERROR_MESSAGE,-
                                02A8   612                        P1=#-1                        ; expected data
          FFFFFFFF 8F     DD    02A8                     PUSHL    #-1
          00000442'EF     DF    02AE                     PUSHAL   ERROR_MESSAGE
          00000098'EF     DF    02B4                     PUSHAL   T_MARCH_ERR
          00000000'EF     DD    02BA                     PUSHL    KA_UNIT_NO
                   03     DD    02C0                     PUSHL    #$ER
                                02C2       ;;; TEST 10, SUBTEST 3, ERROR 3
     000100D0 9F   05     FB    02C2                     CALLS    #$$M, @#DS$ERRHARD
                                02C9   613
                56   04   C0    02C9   614 39$:   ADDL2    #4,R6                            ; incr index
  54    56   0000001C'EF  00    02CC   615        CMPV     #0,L_V_SIZE,R6,R4                ; on segment boundary?
                     03   13    02D5   616        BEQL     40$                              ; br = on segment boundary
                   FF8F   31    02D7   617        BRW      30$                              ; br = not on boundary
                                02DA   618 40$:   $DS_BREAK                                 ; check for ^C
     00010058 9F     6E   FA    02DA                     CALLG    (SP), @#DS$BREAK
          00000014'EF     D6    02E1   619        INCL     V_MAP_BIT                        ; incl map bit pointer
 03 00000020'EF   00000014'EF  E1  02E7  620      BBC      V_MAP_BIT,L_MAP_ACTL,45$         ; br = hole
                   FF73   31    02F3   621        BRW      30$                              ; br = no hole
       00000008'EF   56   D1    02F6   622 45$:   CMPL     R6,L_SIZE_ACTL                   ; end of physical memory?
                   DB     19    02FD   623        BLSS     40$                              ; br = not end of memory
                                02FF   624 ;
                                02FF   625 ; Reverse march, check old data, load new pattern of 0s, check new pattern
                                02FF   626 ;
   00000024'EF    00000312'8F  D0  02FF  627 47$: MOVL     #53$,L_RTRN_ADR                  ; load return address
                56   04   C2    030A   628        SUBL2    #4,R6                            ; decrement index
                57   66   D1    030D   629 50$:   CMPL     (R6),R7                          ; check old pattern
                     1D   13    0310   630        BEQL     55$                              ; br = no error
                                0312   631
                                0312   632 53$:   $DS_ERRHARD_S   UNIT=KA_UNIT_NO,-         ; report error
                                0312   633                        MSGADR=T_MARCH_ERR,-
                                0312   634                        PRLINK=ERROR_MESSAGE,-
                                0312   635                        P1=R7                         ; expected data
                   57     DD    0312                     PUSHL    R7
          00000442'EF     DF    0314                     PUSHAL   ERROR_MESSAGE
          00000098'EF     DF    031A                     PUSHAL   T_MARCH_ERR
          00000000'EF     DD    0320                     PUSHL    KA_UNIT_NO
                   04     DD    0326                     PUSHL    #$ER
                                0328       ;;; TEST 10, SUBTEST 3, ERROR 4
     000100D0 9F   05     FB    0328                     CALLS    #$$M, @#DS$ERRHARD
                                032F   636
   00000024'EF    00000340'8F  D0  032F  637 55$: MOVL     #59$,L_RTRN_ADR                  ; load return address
                     66   D4    033A   638 57$:   CLRL     (R6)                             ; load new pattern
                     66   D5    033C   639        TSTL     (R6)                             ; check new pattern
                     1D   13    033E   640        BEQL     60$                              ; br = no error
                                0340   641
                                0340   642 59$:   $DS_ERRHARD_S   UNIT=KA_UNIT_NO,-         ; report error
                                0340   643                        MSGADR=T_MARCH_ERR,-
                                0340   644                        PRLINK=ERROR_MESSAGE,-
                                0340   645                        P1=#0                         ; expected data
                   00     DD    0340                     PUSHL    #0
          00000442'EF     DF    0342                     PUSHAL   ERROR_MESSAGE
          00000098'EF     DF    0348                     PUSHAL   T_MARCH_ERR
          00000000'EF     DD    034E                     PUSHL    KA_UNIT_NO
                   05     DD    0354                     PUSHL    #$ER
                                0356       ;;; TEST 10, SUBTEST 3, ERROR 5
     000100D0 9F   05     FB    0356                     CALLS    #$$M, @#DS$ERRHARD
```

```
                                    035D   646
          00000000'EF      56   D1  035D   647 60$:      CMPL     R6,A_FREE_MEM                        ; lower limit reached?
                           2A   13  0364   648           BEQL     100$                                 ; br = lower limit reached
   54    56   0000001C'EF  00   EC  0366   649           CMPV     #0,L_V_SIZE,R6,R4                    ; on segment boundary?
                           03   13  036F   650           BEQL     65$                                  ; br = on boundary
                         FF8B   31  0371   651           BRW      47$                                  ; br = not on boundary
                                    0374   652 65$:      $DS_BREAK                                     ; Check for ^C [01]
          00010058 9F      6E   FA  0374                          CALLG    (SP), @#DS$BREAK
                  00000014'EF   D7  037B   653           DECL     V_MAP_BIT                            ; decr map bit pointer
 E7 00000020'EF   00000014'EF   E1  0381   654           BBC      V_MAP_BIT,L_MAP_ACTL,65$             ; br = hole
                         FF6F   31  038D   655           BRW      47$                                  ; br = no hole
                                    0390   656
                                    0390   657 100$:     $DS_CLRVEC_S     VECTOR=#SCB$L_MACHCHK
                           04   DD  0390                          PUSHL    #SCB$L_MACHCHK
          00010168 9F      01   FB  0392                          CALLS    #1, @#DS$CLRVEC
   00F20004 9F    02000000 8F   CA  0399   658           BICL2    #M_DSABL_ECC,@#A_MEM_CSR1            ; re-enable ECC
                                    03A4   659           $DS_ENDSUB
                                    03A4       T10_S3_X:
   00010038 9F    00000018'EF   FA  03A4                          CALLG    $S$, @#DS$ENDSUB
                                    03AF   660
                                    03AF   661           $DS_ENDTEST
                     50    01   D0  03AF                          MOVL     #1, R0            ; NORMAL EXIT
                                    03B2       TEST_010_X::
          00010058 9F      6E   FA  03B2                          CALLG    (SP), @#DS$BREAK
                                04  03B9                          RET                        ; RETURN TO TEST SEQUENCER
                                    03BA   662           $DS_ENDMOD
                                00000000                          .PSECT   $TSTCNT, NOEXE, NOWRT, OVR, LONG
                       0000000A     0000                          .LONG    $TN
                                    0004   663           .END
```

```
$$$                         = 00000018 R      06      DS$HELP                       000101B0
$$ARGS                      = 0000000A                DS$INITSCB                    00010170
$$E                         = 00000001                DS$INLOOP                     00010048
$$M                         = 00000005                DS$K_BERROR                   ********     X    02
$$N                         = 00000001                DS$K_ERROR                  = 00000002
$$S                         = FFFFFFFF                DS$K_NORMAL                 = 00000001
$$T1                        = 0000002C                DS$K_SEVERE                 = 00000004
$ENV                        = 00000001  G             DS$K_SUBSYS                 = 00000066
$ER                         = FFFFFFFF                DS$K_WARNING                = 00000000
$MO                         = 00000001  G             DS$LOAD                       00010198
$S$                         = 00000018 R      06      DS$LOADPCS                    000101C0
$ST                         = 00000000                DS$MAPDBGBLOCK                00010118
$TN                         = 0000000A                DS$MMOFF                      00010158
ALL                         = 00000008  G             DS$MMON                       00010150
A_FREE_MEM                    ********   X    04      DS$MOVPHY                     00010148
A_MCHK_BUFFER                 ********   X    02      DS$MOVVRT                     00010140
A_MEM_CSR1                  = 00F20004                DS$PARSE                      000100B8
A_MEM_CSR3                  = 00F20008                DS$PRINTB                     000100E0
A_MEM_LIM                   = 00500000                DS$PRINTF                     000100F0
BASE_010                      00000000 R      04      DS$PRINTS                     000100F8
BIT...                      = 00000011                DS$PRINTSIG                   00010100
B_FLAGS                       00000028 R      02      DS$PRINTX                     000100E8
CEP_FUNCTIONAL              = 00000000                DS$PROBE                      000101A0
CEP_REPAIR                  = 00000001                DS$RELBUF                     00010128
CPU$V_COMET                 = 00000002                DS$RELMEM                     00010138
CPU$V_HS                    = 00000000                DS$SETIPL                     00010178
CPU$V_STAR                  = 00000001                DS$SETMAP                     00010188
DATA_010                      0000000C R      04      DS$SETPRIEXV                  00010110
DEFAULT                     = 00000000  G             DS$SETVEC                     00010160
DS$ABORT                      00010020                DS$SHOCHAN                    00010190
DS$ASKADR                     00010090                DS$SUMMARY                    00010028
DS$ASKDATA                    00010080                DS$WAITMS                     00010060
DS$ASKLGCL                    00010098                DS$WAITUS                     00010068
DS$ASKSTR                     000100A0                DS$_ARITH                   = 006600D0
DS$ASKVLD                     00010088                DS$_BADLINK                 = 006600F0
DS$ATTACH                     000101A8                DS$_BADTYPE                 = 006600E8
DS$BGNSUB                     00010030                DS$_CHME                    = 006600A8
DS$BRANCH                     000100A8                DS$_CHMK                    = 006600E0
DS$BREAK                      00010058                DS$_DEVNAME                 = 00660108
DS$CANWAIT                    00010070                DS$_ERROR                   = 00660002
DS$CHANNEL                    00010180                DS$_FHWE                    = 00660068
DS$CKLOOP                     00010040                DS$_FRAGBUF                 = 00660080
DS$CLRVEC                     00010168                DS$_ICBUSY                  = 006600C8
DS$CNTRLC                     00010078                DS$_ICERR                   = 006600C0
DS$CVTREG                     000100B0                DS$_IHWE                    = 00660060
DS$ENDPASS                    00010010                DS$_ILLCHAR                 = 00660018
DS$ENDSUB                     00010038                DS$_ILLPAGCNT               = 00660078
DS$ERRDEV                     000100C8                DS$_ILLUNIT                 = 00660100
DS$ERRHARD                    000100D0                DS$_INSFMEM                 = 00660050
DS$ERRPREP                    00010108                DS$_IPL2HI                  = 006600B8
DS$ERRSOFT                    000100D8                DS$_IVADDR                  = 00660040
DS$ERRSYS                     000100C0                DS$_IVVECT                  = 00660038
DS$ESCAPE                     00010050                DS$_KRNLSTK                 = 00660090
DS$FREEDBGSYM                 000101B8                DS$_LOGIC                   = 00660070
DS$GETBUF                     00010120                DS$_MCHK                    = 00660088
DS$GETMEM                     00010130                DS$_MMOFF                   = 00660058
DS$GPHARD                     00010018                DS$_NEEDUNIT                = 006600F8
```

```
DS$_NOPCS                      = 00660110        DSA$V_BELL                     = 00000003
DS$_NORMAL                     = 00660001        DSA$V_BINARY                   = 00000001
DS$_NOSUPPORT                  = 006600B1        DSA$V_CRD_AUTOTEST             = 0000000B
DS$_NOTDON                     = 00660030        DSA$V_CRD_MENUTEST             = 00000010
DS$_NOTIMP                     = 006600B0        DSA$V_CRD_TRACE                = 00000011
DS$_NULLSTR                    = 00660010        DSA$V_DEBUG                    = 0000001A
DS$_OVERFLOW                   = 00660008        DSA$V_HALT                     = 00000000
DS$_POWER                      = 00660098        DSA$V_IE1                      = 00000004
DS$_PROGERR                    = 00660020        DSA$V_IE2                      = 00000005
DS$_SEVERE                     = 00660004        DSA$V_IE3                      = 00000006
DS$_TRANSL                     = 006600A0        DSA$V_IES                      = 00000007
DS$_TRUNCATE                   = 00660028        DSA$V_LOAD_DEBUGGER            = 0000001E
DS$_UNEXPINT                   = 006600D8        DSA$V_LOOP                     = 00000002
DS$_VASFULL                    = 00660048        DSA$V_NORPT                    = 0000001B
DS$_WARNING                    = 00660000        DSA$V_OPER                     = 0000000C
DSA$AL_APTMAIL                   0000FE00        DSA$V_PASSO                    = 0000001D
DSA$AT_APTTXT                    0000FA00        DSA$V_PROMPT                   = 0000000D
DSA$GL_APTCOM                    0000FE04        DSA$V_QA                       = 0000000F
DSA$GL_DEVLEN                    0000FE58        DSA$V_QUICK                    = 00000008
DSA$GL_ERRNO                     0000FE44        DSA$V_SEARCH                   = 0000000E
DSA$GL_EVENT                     0000FE48        DSA$V_TRACE                    = 0000000A
DSA$GL_FLAGS                     0000FE00        DSA$V_USER                     = 0000001C
DSA$GL_MSGTYP                    0000FE40        DSA$V_VERIFY                   = 00000009
DSA$GL_PASSES                    0000FE08        ENV$M_DOMAIN                   = 00000002
DSA$GL_PASSNO                    0000FE54        ENV$M_LEVEL                    = 00000001
DSA$GL_SECTNO                    0000FE10        ENV$M_SUPER                    = 000003FC
DSA$GL_SID                       0000FE14        ENV$S_DOMAIN                   = 00000001
DSA$GL_SUBTNO                    0000FE4C        ENV$S_LEVEL                    = 00000001
DSA$GL_TESTNO                    0000FE50        ENV$S_SUPER                    = 00000008
DSA$GL_UNITS                     0000FE0C        ENV$V_DOMAIN                   = 00000001
DSA$GQ_MSGPTR                    0000FE68        ENV$V_LEVEL                    = 00000000
DSA$GT_DEVNAM                    0000FE5C        ENV$V_SUPER                    = 00000002
DSA$M_APT                      = 80000000        ENV$_CPU                       = 00000000
DSA$M_BELL                     = 00000008        ENV$_FUNCTIONAL                = 00000000
DSA$M_BINARY                   = 00000002        ENV$_REPAIR                    = 00000001
DSA$M_CRD_AUTOTEST             = 00000800        ENV$_SUPER                     = 00000001
DSA$M_CRD_MENUTEST             = 00010000        ENV$_SYSTEM                    = 00000001
DSA$M_CRD_TRACE                = 00020000        ERR$_MSGADR                    = 0000000C
DSA$M_DEBUG                    = 04000000        ERR$_NARGS                     = 0000000A
DSA$M_HALT                     = 00000001        ERR$_NUM                       = 00000004
DSA$M_IE1                      = 00000010        ERR$_P1                        = 00000014
DSA$M_IE2                      = 00000020        ERR$_P2                        = 00000018
DSA$M_IE3                      = 00000040        ERR$_P3                        = 0000001C
DSA$M_IES                      = 00000080        ERR$_P4                        = 00000020
DSA$M_LOAD_DEBUGGER            = 40000000        ERR$_P5                        = 00000024
DSA$M_LOOP                     = 00000004        ERR$_P6                        = 00000028
DSA$M_NORPT                    = 08000000        ERR$_POINTER                   = 00000010
DSA$M_OPER                     = 00001000        ERR$_UNIT                      = 00000008
DSA$M_PASSO                    = 20000000        ERROR_MESSAGE                    00000442 R       02
DSA$M_PROMPT                   = 00002000        HALT                           = 00000004  G
DSA$M_QA                       = 00008000        HP$A_DEPENDENT                   00000032
DSA$M_QUICK                    = 00000100        HP$A_DEVICE                      00000018
DSA$M_SEARCH                   = 00004000        HP$A_DVA                         0000001C
DSA$M_TRACE                    = 00000400        HP$A_LINK                        00000020
DSA$M_USER                     = 10000000        HP$B_DRIVE                       0000000B
DSA$M_VERIFY                   = 00000200        HP$B_FLAGS                       0000000A
DSA$V_APT                      = 0000001F        HP$M_ALLOC                     = 00000001
```

```
HP$M_WASALL     = 00000002              MEM_SIZE          000004D3 R      02
HP$Q_DEVICE       00000000              MSG_010           00000002 R      04
HP$T_DEVICE       0000000C              M_CHIP_SIZE     = 01000000
HP$T_TYPE         00000026              M_DSABL_ECC     = 02000000
HP$V_ALLOC      = 00000000              M_MAP_BIT         00000010 R      02
HP$V_WASALL     = 00000001              M_MEM_ERR_FLAG  = 00000008
HP$W_SIZE         00000008              M_SB_ERR        = 01000000
HP$W_VECTOR       00000024              M_UNXP_FLAG     = 00000002
IPR             = 00000006   G          PAR$M_ATDEF     = 00000010
KA$B_ACC_TYPE     00000042              PAR$M_ATHI      = 00000008
KA$B_SID_TYPE     0000003D              PAR$M_ATLO      = 00000004
KA$K_LEN          00000043              PAR$M_NODEF     = 00000002
KA$L_FLAGS        00000032              PAR$V_ATDEF     = 00000004
KA$L_SID          0000003A              PAR$V_ATHI      = 00000003
KA$M_CHAR       = 00000100              PAR$V_ATLO      = 00000002
KA$M_CRC        = 00000010              PAR$V_NODEF     = 00000001
KA$M_D_FLOAT    = 00000002              PAR$_BIN        = 00000002
KA$M_EDIT       = 00000080              PAR$_DEC        = 0000000A
KA$M_F_FLOAT    = 00000001              PAR$_HEX        = 00000010
KA$M_G_FLOAT    = 00000004              PAR$_NO         = 00000000
KA$M_H_FLOAT    = 00000008              PAR$_OCT        = 00000008
KA$M_PACKED     = 00000020              PAR$_YES        = 00000001
KA$M_PACK_MUL   = 00000040              POWER           = 00000003   G
KA$M_TODR       = 00010000              PR$_MCESR         ********    X   02
KA$V_CHAR       = 00000008              PSL$C_EXEC      = 00000001
KA$V_CRC        = 00000004              PSL$C_KERNEL    = 00000000
KA$V_D_FLOAT    = 00000001              PSL$C_SUPER     = 00000002
KA$V_EDIT       = 00000007              PSL$C_USER      = 00000003
KA$V_F_FLOAT    = 00000000              PSL$K_EXEC      = 00000001
KA$V_G_FLOAT    = 00000002              PSL$K_KERNEL    = 00000000
KA$V_H_FLOAT    = 00000003              PSL$K_SUPER     = 00000002
KA$V_PACKED     = 00000005              PSL$K_USER      = 00000003
KA$V_PACK_MUL   = 00000006              PSL$M_C         = 00000001
KA$V_TODR       = 00000010              PSL$M_CBIT      = 00000001
KA$W_LATENCY      0000003E              PSL$M_CM        = 80000000
KA$W_PROGRESS     00000040              PSL$M_CURMOD    = 03000000
KA$W_RESERVED     00000038              PSL$M_DV        = 00000080
KA$W_WCS          00000036              PSL$M_FPD       = 08000000
KA_PTABLE         ********    X   04    PSL$M_FU        = 00000040
KA_UNIT_NO        ********    X   02    PSL$M_IPL       = 001F0000
LDPCTX          = 0000000B   G          PSL$M_IS        = 04000000
L_128K          = 00020000              PSL$M_IV        = 00000020
L_512K          = 00080000              PSL$M_N         = 00000008
L_INCR            00000018 R      02    PSL$M_NBIT      = 00000008
L_KA_FLAGS        ********    X   04    PSL$M_PRVMOD    = 00C00000
L_KSIZE_PTBL      ********    X   02    PSL$M_SAFBITS   = 000037FF
L_MAP_ACTL        00000020 R      02    PSL$M_TBIT      = 00000010
L_RTRN_ADR        00000024 R      02    PSL$M_TP        = 40000000
L_SAVE_CSR3       00000004 R      02    PSL$M_V         = 00000002
L_SIZE_ACTL       00000008 R      02    PSL$M_VBIT      = 00000002
L_SIZE_CSR        00000000 R      02    PSL$M_Z         = 00000004
L_SIZE_PTBL       0000000C R      02    PSL$M_ZBIT      = 00000004
L_V_SIZE          0000001C R      02    PSL$S_CURMOD    = 00000002
MANUAL          = 00000001   G          PSL$S_IPL       = 00000005
MCHK            = 00000005   G          PSL$S_PRVMOD    = 00000002
MCHK_SERVICE      0000052C R      02    PSL$V_C         = 00000000
MEM             = 00000009   G          PSL$V_CBIT      = 00000000
```

```
PSL$V_CM                        = 0000001F            SYS$ALLOC                         00010238
PSL$V_CURMOD                    = 00000018            SYS$ASCTIM                        00010248
PSL$V_DV                        = 00000007            SYS$ASSIGN                        00010250
PSL$V_FPD                       = 0000001B            SYS$BINTIM                        00010258
PSL$V_FU                        = 00000006            SYS$CANCEL                        00010260
PSL$V_IPL                       = 00000010            SYS$CANTIM                        00010268
PSL$V_IS                        = 0000001A            SYS$CLOSE                         000105B8
PSL$V_IV                        = 00000005            SYS$CLREF                         00010298
PSL$V_N                         = 00000003            SYS$CONNECT                       000105C0
PSL$V_NBIT                      = 00000003            SYS$DALLOC                        000102D8
PSL$V_PRVMOD                    = 00000016            SYS$DASSGN                        000102E0
PSL$V_TBIT                      = 00000004            SYS$DISCONNECT                    000105D0
PSL$V_TP                        = 0000001E            SYS$FAO                           00010350
PSL$V_V                         = 00000001            SYS$FAOL                          00010358
PSL$V_VBIT                      = 00000001            SYS$GET                           00010580
PSL$V_Z                         = 00000002            SYS$GETCHN                        000104C8
PSL$V_ZBIT                      = 00000002            SYS$GETTIM                        00010378
SCB$L_ACCESS                      00000020            SYS$LKWSET                        000103A0
SCB$L_ARITH                       00000034            SYS$NUMTIM                        000103B8
SCB$L_BREAK                       0000002C            SYS$OPEN                          00010608
SCB$L_CHME                        00000044            SYS$QIO                           000103C8
SCB$L_CHMK                        00000040            SYS$QIOW                          00010200
SCB$L_CHMS                        00000048            SYS$READ                          00010590
SCB$L_CHMU                        0000004C            SYS$READEF                        000103D0
SCB$L_COMPAT                      00000030            SYS$SETAST                        000103F8
SCB$L_KNLSTK                      00000008            SYS$SETEF                         00010400
SCB$L_MACHCHK                     00000004            SYS$SETIMR                        00010420
SCB$L_OPCCUS                      00000014            SYS$SETPRI                        00010428
SCB$L_OPCDEC                      00000010            SYS$SETPRT                        00010430
SCB$L_POWER                       0000000C            SYS$SETRWM                        00010438
SCB$L_RADRMOD                     0000001C            SYS$SETSWM                        00010448
SCB$L_ROPRAND                     00000018            SYS$ULKPAG                        00010460
SCB$L_RXDB                        000000F8            SYS$ULWSET                        00010468
SCB$L_SFTLVL1                     00000084            SYS$UNWIND                        00010470
SCB$L_SFTLVL10                    000000A8            SYS$WAITFR                        00010478
SCB$L_SFTLVL11                    000000AC            SYS$WFLAND                        00010488
SCB$L_SFTLVL12                    000000B0            SYS$WFLOR                         00010490
SCB$L_SFTLVL13                    000000B4            T10_S1                            0000002A RG      04
SCB$L_SFTLVL14                    000000B8            T10_S1_X                          00000104 R       04
SCB$L_SFTLVL15                    000000BC            T10_S2                            0000010F RG      04
SCB$L_SFTLVL2                     00000088            T10_S2_X                          000001B2 R       04
SCB$L_SFTLVL3                     0000008C            T10_S3                            000001BD RG      04
SCB$L_SFTLVL4                     00000090            T10_S3_X                          000003A4 R       04
SCB$L_SFTLVL5                     00000094            TABLE_T                           00000336 R       02
SCB$L_SFTLVL6                     00000098            TEST_010                          00000010 RG      04
SCB$L_SFTLVL7                     0000009C            TEST_010_X                        000003B2 RG      04
SCB$L_SFTLVL8                     000000A0            TU58                            = 00000002  G
SCB$L_SFTLVL9                     000000A4            T_DPATH_ERR                       0000007A R       02
SCB$L_TBIT                        00000028            T_MARCH_ERR                       00000098 R       02
SCB$L_TIMER                       000000C0            T_MEM_ERR                         0000028B R       02
SCB$L_TRANSL                      00000024            T_MEM_MAP                         000002D6 R       02
SCB$L_TXDB                        000000FC            T_NO_KA730                        00000029 R       02
SCB$L_ZERO                        00000000            T_NO_MEM_TST                      000000B8 R       02
SEP_FUNCTIONAL                  = 00000002            T_SIZE_1_ERR                      00000126 R       02
SEP_REPAIR                      = 00000003            T_SIZE_2_ERR                      000001E9 R       02
SIZ...                          = 00000001            T_SIZ_ERR                         0000005F R       02
SIZ_ERR                           0000047D R      02  T_UNXP_MC_ERR                     000000EC R       02
```

```
UBI                             = 0000000A  G
V_CHIP_SIZE                     = 00000018
V_MAP_BIT                         00000014 R      02
V_MEM_ERR_FLAG                  = 00000003
V_SB_ERR                        = 00000018
V_UNXP_FLAG                     = 00000001
WCS                             = 00000007  G

                                          +----------------+
                                          ! Psect synopsis !
                                          +----------------+

PSECT name                      Allocation          PSECT No.  Attributes
----------                      ----------          ---------  ----------
.  ABS  .                       00000000  (     0.)  00 (  0.)  NOPIC   USR   CON   ABS   LCL NOSHR NOEXE NORD  NOWRT NOVEC BYTE
. BLANK .                       00000000  (     0.)  01 (  1.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD    WRT NOVEC BYTE
ENKAXI                          00000566  (  1382.)  02 (  2.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD  NOWRT NOVEC PAGE
$ABS$                           00010610  (67088.)  03 (  3.)  NOPIC   USR   CON   ABS   LCL NOSHR   EXE   RD    WRT NOVEC BYTE
TEST_010                        000003BA  (   954.)  04 (  4.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD  NOWRT NOVEC PAGE
DISPATCH                        00000018  (    24.)  05 (  5.)  NOPIC   USR   CON   REL   LCL NOSHR NOEXE   RD  NOWRT NOVEC LONG
ARGLIST                         00000024  (    36.)  06 (  6.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD  NOWRT NOVEC LONG
$TSTCNT                         00000004  (     4.)  07 (  7.)  NOPIC   USR   OVR   REL   LCL NOSHR NOEXE   RD  NOWRT NOVEC LONG
```

```
                                            +------------------------+
                                            ! Symbol Cross Reference !
                                            +------------------------+
SYMBOL                        VALUE         DEFINITION      REFERENCES...
------                        -----         ----------      -------------
$$$                           =00000018-R   562    (10)    407   (8)       484   (9)       562   (10)
$$ARGS                        =0000000A     84     (2)      84   (2)
$$E                           =00000001     562    (10)    449   (8)       513   (9)       659   (10)
$$M                           =00000005     645    (10)    375   (7)       447   (8)       503   (9)       585   (10)
                                                           602   (10)      612   (10)      635   (10)      645   (10)
$$N                           =00000001     645    (10)    262   (5)     #-264   (5)       297   (5)       306   (5)
                                                         #-379   (7)       434   (8)       447   (8)     #-492   (9)
                                                           503   (9)       585   (10)      602   (10)      612   (10)
                                                           635   (10)      645   (10)       88   (2)
$$S                           =FFFFFFFF     661    (10)    361   (7)       375   (7)       384   (8)       407   (8)
                                                           452   (9)       484   (9)       517   (10)      562   (10)
$$T1                          =0000002C     84     (2)      84   (2)
$ENV                          =00000001     67     (2)
$ER                           =FFFFFFFF     661    (10)  #-327   (6)       407   (8)     #-447   (8)       484   (9)
                                                         #-503   (9)       562   (10)    #-585   (10)    #-602   (10)
                                                         #-612   (10)    #-635   (10)    #-645   (10)
$MO                           =00000001     662    (10)    662   (10)
$S$                           =00000018-R   562    (10)    407   (8)       449   (8)       484   (9)       513   (9)
                                                           562   (10)      659   (10)
$ST                           =00000000     661    (10)    375   (7)       384   (8)       407   (8)       447   (8)
                                                           449   (8)       452   (9)       484   (9)       503   (9)
                                                           505   (9)       513   (9)       517   (10)      562   (10)
                                                           585   (10)      602   (10)      612   (10)      635   (10)
                                                           645   (10)      659   (10)      661   (10)
$TN                           =0000000A     662    (10)    361   (7)       375   (7)       380   (7)       384   (8)
                                                           447   (8)       452   (9)       493   (9)       503   (9)
                                                           517   (10)      585   (10)      602   (10)      612   (10)
                                                           635   (10)      645   (10)      661   (10)      662   (10)
ALL                           =00000008     88     (2)     375   (7)
A_FREE_MEM                     00000000-XR               #-490   (9)     #-494   (9)     #-566   (10)    #-591   (10)
                                                         #-647   (10)
A_MCHK_BUFFER                  00000000-XR                 265   (5)     #-345   (6)     #-354   (6)
A_MEM_CSR1                    =00F20004     118    (2)   #-486   (9)     #-658   (10)
A_MEM_CSR3                    =00F20008     117    (2)   #-409   (8)     #-415   (8)
A_MEM_LIM                     =00500000     116    (2)   #-332   (6)
BASE_010                       00000000-R   361    (7)     375   (7)
BIT...                        =00000011     87     (2)      67   (2)        80   (2)        81   (2)        82   (2)
                                                            83   (2)        86   (2)        87   (2)
B_FLAGS                        00000028-R   104    (2)     256   (5)     #-355   (6)     #-408   (8)     #-489   (9)
                                                         #-565   (10)
CEP_FUNCTIONAL                =00000000     67     (2)
CEP_REPAIR                    =00000001     67     (2)      67   (2)
CPU$V_COMET                   =00000002     80     (2)
CPU$V_HS                      =00000000     80     (2)
CPU$V_STAR                    =00000001     80     (2)
DATA_010                       0000000C-R   375    (7)     375   (7)
DEFAULT                       =00000000     88     (2)     375   (7)
DS$ABORT                       00010020     85     (2)
DS$ASKADR                      00010090     85     (2)
DS$ASKDATA                     00010080     85     (2)
```

```
DS$ASKLGCL                00010098     85     (2)
DS$ASKSTR                 000100A0     85     (2)
DS$ASKVLD                 00010088     85     (2)
DS$ATTACH                 000101A8     85     (2)
DS$BGNSUB                 00010030     85     (2)      407    (8)       484    (9)       562    (10)
DS$BRANCH                 000100A8     85     (2)      327    (6)
DS$BREAK                  00010058     85     (2)      576    (10)      618    (10)      652    (10)      661    (10)
DS$CANWAIT                00010070     85     (2)
DS$CHANNEL                00010180     85     (2)
DS$CKLOOP                 00010040     85     (2)      505    (9)
DS$CLRVEC                 00010168     85     (2)      511    (9)       657    (10)
DS$CNTRLC                 00010078     85     (2)
DS$CVTREG                 000100B0     85     (2)
DS$ENDPASS                00010010     85     (2)
DS$ENDSUB                 00010038     85     (2)      449    (8)       513    (9)       659    (10)
DS$ERRDEV                 000100C8     85     (2)
DS$ERRHARD                000100D0     85     (2)      447    (8)       503    (9)       585    (10)      602    (10)
                                                       612    (10)      635    (10)      645    (10)
DS$ERRPREP                00010108     85     (2)
DS$ERRSOFT                000100D8     85     (2)
DS$ERRSYS                 000100C0     85     (2)
DS$ESCAPE                 00010050     85     (2)
DS$FREEDBGSYM             000101B8     85     (2)
DS$GETBUF                 00010120     85     (2)
DS$GETMEM                 00010130     85     (2)
DS$GPHARD                 00010018     85     (2)
DS$HELP                   000101B0     85     (2)
DS$INITSCB                00010170     85     (2)
DS$INLOOP                 00010048     85     (2)
DS$K_BERROR               00000000-XR                #-327    (6)
DS$K_ERROR               =00000002     81     (2)
DS$K_NORMAL              =00000001     81     (2)
DS$K_SEVERE              =00000004     81     (2)
DS$K_SUBSYS              =00000066     81     (2)      81     (2)
DS$K_WARNING             =00000000     81     (2)
DS$LOAD                   00010198     85     (2)
DS$LOADPCS                000101C0     85     (2)
DS$MAPDBGBLOCK            00010118     85     (2)
DS$MMOFF                  00010158     85     (2)
DS$MMON                   00010150     85     (2)
DS$MOVPHY                 00010148     85     (2)
DS$MOVVRT                 00010140     85     (2)
DS$PARSE                  000100B8     85     (2)
DS$PRINTB                 000100E0     85     (2)      297    (5)       306    (5)
DS$PRINTF                 000100F0     85     (2)      379    (7)       434    (8)       492    (9)
DS$PRINTS                 000100F8     85     (2)
DS$PRINTSIG               00010100     85     (2)      265    (5)
DS$PRINTX                 000100E8     85     (2)      262    (5)       264    (5)
DS$PROBE                  000101A0     85     (2)      326    (6)
DS$RELBUF                 00010128     85     (2)
DS$RELMEM                 00010138     85     (2)
DS$SETIPL                 00010178     85     (2)
DS$SETMAP                 00010188     85     (2)
DS$SETPRIEXV              00010110     85     (2)
DS$SETVEC                 00010160     85     (2)      487    (9)       564    (10)
DS$SHOCHAN                00010190     85     (2)
DS$SUMMARY                00010028     85     (2)
```

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                                                                              D 11
ZZ-ENKAX-1.3    Cross reference                                            3-AUG-1983          Fiche 3  Frame D11          Sequence 545
ENKAXI                              VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:56:44  VAX-11 Macro V03-00          Page  28
Cross reference                                                             3-AUG-1983 10:03:22  WRKD$0:[PAN.ENKAX]ENKAXI.MAR;75  (11)

DS$WAITMS                        00010060     85       (2)
DS$WAITUS                        00010068     85       (2)
DS$_ARITH                       =006600D0     81       (2)
DS$_BADLINK                     =006600F0     81       (2)
DS$_BADTYPE                     =006600E8     81       (2)
DS$_CHME                        =006600A8     81       (2)
DS$_CHMK                        =006600E0     81       (2)
DS$_DEVNAME                     =00660108     81       (2)
DS$_ERROR                       =00660002     81       (2)
DS$_FHWE                        =00660068     81       (2)
DS$_FRAGBUF                     =00660080     81       (2)
DS$_ICBUSY                      =006600C8     81       (2)
DS$_ICERR                       =006600C0     81       (2)
DS$_IHWE                        =00660060     81       (2)
DS$_ILLCHAR                     =00660018     81       (2)
DS$_ILLPAGCNT                   =00660078     81       (2)
DS$_ILLUNIT                     =00660100     81       (2)
DS$_INSFMEM                     =00660050     81       (2)
DS$_IPL2HI                      =006600B8     81       (2)
DS$_IVADDR                      =00660040     81       (2)
DS$_IVVECT                      =00660038     81       (2)
DS$_KRNLSTK                     =00660090     81       (2)
DS$_LOGIC                       =00660070     81       (2)
DS$_MCHK                        =00660088     81       (2)       347     (6)
DS$_MMOFF                       =00660058     81       (2)
DS$_NEEDUNIT                    =006600F8     81       (2)
DS$_NOPCS                       =00660110     81       (2)
DS$_NORMAL                      =00660001     81       (2)
DS$_NOSUPPORT                   =006600B1     81       (2)
DS$_NOTDON                      =00660030     81       (2)
DS$_NOTIMP                      =006600B0     81       (2)       81      (2)
DS$_NULLSTR                     =00660010     81       (2)
DS$_OVERFLOW                    =00660008     81       (2)
DS$_POWER                       =00660098     81       (2)
DS$_PROGERR                     =00660020     81       (2)
DS$_SEVERE                      =00660004     81       (2)
DS$_TRANSL                      =006600A0     81       (2)
DS$_TRUNCATE                    =00660028     81       (2)
DS$_UNEXPINT                    =006600D8     81       (2)
DS$_VASFULL                     =00660048     81       (2)
DS$_WARNING                     =00660000     81       (2)       81      (2)
DSA$AL_APTMAIL                   0000FE00     80       (2)
DSA$AT_APTTXT                    0000FA00     80       (2)
DSA$GL_APTCOM                    0000FE04     80       (2)
DSA$GL_DEVLEN                    0000FE58     80       (2)
DSA$GL_ERRNO                     0000FE44     80       (2)
DSA$GL_EVENT                     0000FE48     80       (2)
DSA$GL_FLAGS                     0000FE00     80       (2)
DSA$GL_MSGTYP                    0000FE40     80       (2)
DSA$GL_PASSES                    0000FE08     80       (2)
DSA$GL_PASSNO                    0000FE54     80       (2)
DSA$GL_SECTNO                    0000FE10     80       (2)
DSA$GL_SID                       0000FE14     80       (2)
DSA$GL_SUBTNO                    0000FE4C     80       (2)
DSA$GL_TESTNO                    0000FE50     80       (2)
DSA$GL_UNITS                     0000FE0C     80       (2)
DSA$GQ_MSGPTR                    0000FE68     80       (2)
```

```
ZZ
EN
Sy

$$
$E
$E
$M
$S
$T
BI
CE
CE
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
SE
SE
SI


PS
--
.
.
EN
```

```
DSA$GT_DEVNAM              0000FE5C     80      (2)
DSA$M_APT                 =80000000     80      (2)
DSA$M_BELL                =00000008     80      (2)
DSA$M_BINARY              =00000002     80      (2)
DSA$M_CRD_AUTOTEST        =00000800     80      (2)
DSA$M_CRD_MENUTEST        =00010000     80      (2)
DSA$M_CRD_TRACE           =00020000     80      (2)
DSA$M_DEBUG               =04000000     80      (2)
DSA$M_HALT                =00000001     80      (2)
DSA$M_IE1                 =00000010     80      (2)
DSA$M_IE2                 =00000020     80      (2)
DSA$M_IE3                 =00000040     80      (2)
DSA$M_IES                 =00000080     80      (2)
DSA$M_LOAD_DEBUGGER       =40000000     80      (2)
DSA$M_LOOP                =00000004     80      (2)
DSA$M_NORPT               =08000000     80      (2)
DSA$M_OPER                =00001000     80      (2)
DSA$M_PASSO               =20000000     80      (2)
DSA$M_PROMPT              =00002000     80      (2)
DSA$M_QA                  =00008000     80      (2)
DSA$M_QUICK               =00000100     80      (2)
DSA$M_SEARCH              =00004000     80      (2)
DSA$M_TRACE               =00000400     80      (2)
DSA$M_USER                =10000000     80      (2)
DSA$M_VERIFY              =00000200     80      (2)
DSA$V_APT                 =0000001F     80      (2)
DSA$V_BELL                =00000003     80      (2)
DSA$V_BINARY              =00000001     80      (2)
DSA$V_CRD_AUTOTEST        =0000000B     80      (2)
DSA$V_CRD_MENUTEST        =00000010     80      (2)
DSA$V_CRD_TRACE           =00000011     80      (2)
DSA$V_DEBUG               =0000001A     80      (2)
DSA$V_HALT                =00000000     80      (2)
DSA$V_IE1                 =00000004     80      (2)
DSA$V_IE2                 =00000005     80      (2)
DSA$V_IE3                 =00000006     80      (2)
DSA$V_IES                 =00000007     80      (2)
DSA$V_LOAD_DEBUGGER       =0000001E     80      (2)
DSA$V_LOOP                =00000002     80      (2)
DSA$V_NORPT               =0000001B     80      (2)
DSA$V_OPER                =0000000C     80      (2)
DSA$V_PASSO               =0000001D     80      (2)
DSA$V_PROMPT              =0000000D     80      (2)
DSA$V_QA                  =0000000F     80      (2)
DSA$V_QUICK               =00000008     80      (2)
DSA$V_SEARCH              =0000000E     80      (2)
DSA$V_TRACE               =0000000A     80      (2)
DSA$V_USER                =0000001C     80      (2)
DSA$V_VERIFY              =00000009     80      (2)
ENV$M_DOMAIN              =00000002     67      (2)
ENV$M_LEVEL               =00000001     67      (2)
ENV$M_SUPER               =000003FC     67      (2)
ENV$S_DOMAIN              =00000001     67      (2)
ENV$S_LEVEL               =00000001     67      (2)
ENV$S_SUPER               =00000008     67      (2)
ENV$V_DOMAIN              =00000001     67      (2)        67      (2)
ENV$V_LEVEL               =00000000     67      (2)        67      (2)
```

```
ZZ
EN
Cr

SY
--
$$
$E
$E
$M
$S
$T
BI
CE
CE
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
EN
SE
SE
SI
```

```
                                                                F 11
ZZ-ENKAX-1.3    Cross reference                              3-AUG-1983            Fiche 3  Frame F11          Sequence 547
ENKAXI                             VAX-11/730 Specific CPU Cluster Exercise  3-AUG-1983 13:56:44  VAX-11 Macro V03-00          Page  30
Cross reference                                                              3-AUG-1983 10:03:22  WRKD$0:[PAN.ENKAX]ENKAXI.MAR;75  (11)

ENV$V_SUPER                   =00000002      67       (2)
ENV$_CPU                      =00000000      67       (2)        67       (2)
ENV$_FUNCTIONAL               =00000000      67       (2)        67       (2)
ENV$_REPAIR                   =00000001      67       (2)        67       (2)
ENV$_SUPER                    =00000001      67       (2)
ENV$_SYSTEM                   =00000001      67       (2)        67       (2)
ERR$_MSGADR                   =0000000C      84       (2)
ERR$_NARGS                    =0000000A      84       (2)
ERR$_NUM                      =00000004      84       (2)
ERR$_P1                       =00000014      84       (2)       #-257     (5)       #-262     (5)
ERR$_P2                       =00000018      84       (2)
ERR$_P3                       =0000001C      84       (2)
ERR$_P4                       =00000020      84       (2)
ERR$_P5                       =00000024      84       (2)
ERR$_P6                       =00000028      84       (2)
ERR$_POINTER                  =00000010      84       (2)
ERR$_UNIT                     =00000008      84       (2)
ERROR_MESSAGE                  00000442-R    253      (5)        503      (9)        585      (10)       602      (10)       612      (10)
                                                                 635      (10)       645      (10)
HALT                          =00000004      88       (2)
HP$A_DEPENDENT                 00000032      86       (2)        87       (2)
HP$A_DEVICE                    00000018      86       (2)
HP$A_DVA                       0000001C      86       (2)
HP$A_LINK                      00000020      86       (2)
HP$B_DRIVE                     0000000B      86       (2)
HP$B_FLAGS                     0000000A      86       (2)
HP$M_ALLOC                    =00000001      86       (2)
HP$M_WASALL                   =00000002      86       (2)
HP$Q_DEVICE                    00000000      86       (2)
HP$T_DEVICE                    0000000C      86       (2)
HP$T_TYPE                      00000026      86       (2)
HP$V_ALLOC                    =00000000      86       (2)
HP$V_WASALL                   =00000001      86       (2)
HP$W_SIZE                      00000008      86       (2)
HP$W_VECTOR                    00000024      86       (2)
IPR                           =00000006      88       (2)
KA$B_ACC_TYPE                  00000042      87       (2)
KA$B_SID_TYPE                  0000003D      87       (2)
KA$K_LEN                       00000043      87       (2)
KA$L_FLAGS                     00000032      87       (2)
KA$L_SID                       0000003A      87       (2)
KA$M_CHAR                     =00000100      87       (2)
KA$M_CRC                      =00000010      87       (2)
KA$M_D_FLOAT                  =00000002      87       (2)
KA$M_EDIT                     =00000080      87       (2)
KA$M_F_FLOAT                  =00000001      87       (2)
KA$M_G_FLOAT                  =00000004      87       (2)
KA$M_H_FLOAT                  =00000008      87       (2)
KA$M_PACKED                   =00000020      87       (2)
KA$M_PACK_MUL                 =00000040      87       (2)
KA$M_TODR                     =00010000      87       (2)
KA$V_CHAR                     =00000008      87       (2)
KA$V_CRC                      =00000004      87       (2)
KA$V_D_FLOAT                  =00000001      87       (2)
KA$V_EDIT                     =00000007      87       (2)
KA$V_F_FLOAT                  =00000000      87       (2)
KA$V_G_FLOAT                  =00000002      87       (2)
```

```
KA$V_H_FLOAT      =00000003     87    (2)
KA$V_PACKED       =00000005     87    (2)
KA$V_PACK_MUL     =00000006     87    (2)
KA$V_TODR         =00000010     87    (2)
KA$W_LATENCY       0000003E     87    (2)
KA$W_PROGRESS      00000040     87    (2)
KA$W_RESERVED      00000038     87    (2)
KA$W_WCS           00000036     87    (2)
KA_PTABLE          00000000-XR             #-377   (7)
KA_UNIT_NO         00000000-XR             #-326   (6)    #-447   (8)    #-503   (9)    #-585   (10)
                                           #-602   (10)   #-612   (10)   #-635   (10)   #-645   (10)
LDPCTX            =0000000B     88    (2)
L_128K            =00020000     119   (2)  #-417   (8)
L_512K            =00080000     120   (2)    100   (2)
L_INCR             00000018-R   100   (2)  #-329   (6)    #-332   (6)    #-417   (8)    #-422   (8)
                                           #-430   (8)    #-567   (10)   #-593   (10)
L_KA_FLAGS         00000000-XR               485   (9)
L_KSIZE_PTBL       00000000-XR             #-287   (5)    #-297   (5)    #-410   (8)
L_MAP_ACTL         00000020-R   102   (2)  #-297   (5)    #-306   (5)    #-321   (6)    #-328   (6)
                                           #-434   (8)    #-438   (8)      578   (10)     620   (10)
                                             654   (10)
L_RTRN_ADR         00000024-R   103   (2)    356   (6)    #-488   (9)    #-568   (10)   #-595   (10)
                                           #-604   (10)   #-627   (10)   #-637   (10)
L_SAVE_CSR3        00000004-R   95    (2)  #-297   (5)    #-306   (5)    #-409   (8)    #-438   (8)
L_SIZE_ACTL        00000008-R   96    (2)  #-283   (5)    #-320   (6)    #-329   (6)    #-429   (8)
                                           #-442   (8)    #-579   (10)   #-622   (10)
L_SIZE_CSR         00000000-R   94    (2)  #-282   (5)    #-414   (8)    #-422   (8)
L_SIZE_PTBL        0000000C-R   97    (2)  #-410   (8)    #-440   (8)    #-442   (8)
L_V_SIZE           0000001C-R   101   (2)  #-418   (8)    #-574   (10)   #-615   (10)   #-649   (10)
MANUAL            =00000001     88    (2)
MCHK              =00000005     88    (2)
MCHK_SERVICE       0000052C-R   342   (6)    487   (9)      564   (10)
MEM               =00000009     88    (2)    375   (7)
MEM_SIZE           000004D3-R   317   (6)    428   (8)
MSG_010            00000002-R   361   (7)    375   (7)
M_CHIP_SIZE       =01000000     113   (2)
M_DSABL_ECC       =02000000     114   (2)  #-486   (9)    #-658   (10)
M_MAP_BIT          00000010-R   98    (2)  #-319   (6)    #-328   (6)    #-331   (6)
M_MEM_ERR_FLAG    =00000008     109   (2)
M_SB_ERR          =01000000     111   (2)
M_UNXP_FLAG       =00000002     107   (2)  #-355   (6)
PAR$M_ATDEF       =00000010     82    (2)
PAR$M_ATHI        =00000008     82    (2)
PAR$M_ATLO        =00000004     82    (2)
PAR$M_NODEF       =00000002     82    (2)
PAR$V_ATDEF       =00000004     82    (2)
PAR$V_ATHI        =00000003     82    (2)
PAR$V_ATLO        =00000002     82    (2)
PAR$V_NODEF       =00000001     82    (2)
PAR$_BIN          =00000002     82    (2)
PAR$_DEC          =0000000A     82    (2)
PAR$_HEX          =00000010     82    (2)
PAR$_NO           =00000000     82    (2)
PAR$_OCT          =00000008     82    (2)
PAR$_YES          =00000001     82    (2)
POWER             =00000003     88    (2)
PR$_MCESR          00000000-XR             #-344   (6)
```

```
PSL$C_EXEC                        =00000001      83       (2)
PSL$C_KERNEL                      =00000000      83       (2)
PSL$C_SUPER                       =00000002      83       (2)
PSL$C_USER                        =00000003      83       (2)
PSL$K_EXEC                        =00000001      83       (2)
PSL$K_KERNEL                      =00000000      83       (2)
PSL$K_SUPER                       =00000002      83       (2)
PSL$K_USER                        =00000003      83       (2)
PSL$M_C                           =00000001      83       (2)
PSL$M_CBIT                        =00000001      83       (2)
PSL$M_CM                          =80000000      83       (2)        83       (2)
PSL$M_CURMOD                      =03000000      83       (2)
PSL$M_DV                          =00000080      83       (2)
PSL$M_FPD                         =08000000      83       (2)        83       (2)
PSL$M_FU                          =00000040      83       (2)
PSL$M_IPL                         =001F0000      83       (2)
PSL$M_IS                          =04000000      83       (2)
PSL$M_IV                          =00000020      83       (2)
PSL$M_N                           =00000008      83       (2)
PSL$M_NBIT                        =00000008      83       (2)
PSL$M_PRVMOD                      =00C00000      83       (2)
PSL$M_SAFBITS                     =000037FF      83       (2)
PSL$M_TBIT                        =00000010      83       (2)
PSL$M_TP                          =40000000      83       (2)        83       (2)
PSL$M_V                           =00000002      83       (2)
PSL$M_VBIT                        =00000002      83       (2)
PSL$M_Z                           =00000004      83       (2)
PSL$M_ZBIT                        =00000004      83       (2)
PSL$S_CURMOD                      =00000002      83       (2)
PSL$S_IPL                         =00000005      83       (2)
PSL$S_PRVMOD                      =00000002      83       (2)
PSL$V_C                           =00000000      83       (2)
PSL$V_CBIT                        =00000000      83       (2)
PSL$V_CM                          =0000001F      83       (2)
PSL$V_CURMOD                      =00000018      83       (2)
PSL$V_DV                          =00000007      83       (2)
PSL$V_FPD                         =0000001B      83       (2)
PSL$V_FU                          =00000006      83       (2)
PSL$V_IPL                         =00000010      83       (2)
PSL$V_IS                          =0000001A      83       (2)
PSL$V_IV                          =00000005      83       (2)
PSL$V_N                           =00000003      83       (2)
PSL$V_NBIT                        =00000003      83       (2)
PSL$V_PRVMOD                      =00000016      83       (2)
PSL$V_TBIT                        =00000004      83       (2)
PSL$V_TP                          =0000001E      83       (2)
PSL$V_V                           =00000001      83       (2)
PSL$V_VBIT                        =00000001      83       (2)
PSL$V_Z                           =00000002      83       (2)
PSL$V_ZBIT                        =00000002      83       (2)
SCB$L_ACCESS                       00000020      79       (2)
SCB$L_ARITH                        00000034      79       (2)
SCB$L_BREAK                        0000002C      79       (2)
SCB$L_CHME                         00000044      79       (2)
SCB$L_CHMK                         00000040      79       (2)
SCB$L_CHMS                         00000048      79       (2)
SCB$L_CHMU                         0000004C      79       (2)
```

```
SCB$L_COMPAT                     00000030       79      (2)
SCB$L_KNLSTK                     00000008       79      (2)
SCB$L_MACHCHK                    00000004       79      (2)     #-487     (9)     #-511     (9)     #-564     (10)    #-657     (10)
SCB$L_OPCCUS                     00000014       79      (2)
SCB$L_OPCDEC                     00000010       79      (2)
SCB$L_POWER                      0000000C       79      (2)
SCB$L_RADRMOD                    0000001C       79      (2)
SCB$L_ROPRAND                    00000018       79      (2)
SCB$L_RXDB                       000000F8       79      (2)
SCB$L_SFTLVL1                    00000084       79      (2)
SCB$L_SFTLVL10                   000000A8       79      (2)
SCB$L_SFTLVL11                   000000AC       79      (2)
SCB$L_SFTLVL12                   000000B0       79      (2)
SCB$L_SFTLVL13                   000000B4       79      (2)
SCB$L_SFTLVL14                   000000B8       79      (2)
SCB$L_SFTLVL15                   000000BC       79      (2)
SCB$L_SFTLVL2                    00000088       79      (2)
SCB$L_SFTLVL3                    0000008C       79      (2)
SCB$L_SFTLVL4                    00000090       79      (2)
SCB$L_SFTLVL5                    00000094       79      (2)
SCB$L_SFTLVL6                    00000098       79      (2)
SCB$L_SFTLVL7                    0000009C       79      (2)
SCB$L_SFTLVL8                    000000A0       79      (2)
SCB$L_SFTLVL9                    000000A4       79      (2)
SCB$L_TBIT                       00000028       79      (2)
SCB$L_TIMER                      000000C0       79      (2)
SCB$L_TRANSL                     00000024       79      (2)
SCB$L_TXDB                       000000FC       79      (2)
SCB$L_ZERO                       00000000       79      (2)
SEP_FUNCTIONAL                  =00000002       67      (2)
SEP_REPAIR                      =00000003       67      (2)
SIZ...                          =00000001       87      (2)      67       (2)       80       (2)       82       (2)       83       (2)
                                                                 86       (2)       87       (2)
SIZ_ERR                          0000047D-R     276     (5)      447      (8)
SYS$ALLOC                        00010238       85      (2)
SYS$ASCTIM                       00010248       85      (2)
SYS$ASSIGN                       00010250       85      (2)
SYS$BINTIM                       00010258       85      (2)
SYS$CANCEL                       00010260       85      (2)
SYS$CANTIM                       00010268       85      (2)
SYS$CLOSE                        000105B8       85      (2)
SYS$CLREF                        00010298       85      (2)
SYS$CONNECT                      000105C0       85      (2)
SYS$DALLOC                       000102D8       85      (2)
SYS$DASSGN                       000102E0       85      (2)
SYS$DISCONNECT                   000105D0       85      (2)
SYS$FAO                          00010350       85      (2)
SYS$FAOL                         00010358       85      (2)
SYS$GET                          00010580       85      (2)
SYS$GETCHN                       000104C8       85      (2)
SYS$GETTIM                       00010378       85      (2)
SYS$LKWSET                       000103A0       85      (2)
SYS$NUMTIM                       000103B8       85      (2)
SYS$OPEN                         00010608       85      (2)
SYS$QIO                          000103C8       85      (2)
SYS$QIOW                         00010200       85      (2)
SYS$READ                         00010590       85      (2)
```

```
SYS$READEF                       000103D0      85      (2)
SYS$SETAST                       000103F8      85      (2)
SYS$SETEF                        00010400      85      (2)
SYS$SETIMR                       00010420      85      (2)
SYS$SETPRI                       00010428      85      (2)
SYS$SETPRT                       00010430      85      (2)
SYS$SETRWM                       00010438      85      (2)
SYS$SETSWM                       00010448      85      (2)
SYS$ULKPAG                       00010460      85      (2)
SYS$ULWSET                       00010468      85      (2)
SYS$UNWIND                       00010470      85      (2)
SYS$WAITFR                       00010478      85      (2)
SYS$WFLAND                       00010488      85      (2)
SYS$WFLOR                        00010490      85      (2)
T10_S1                           0000002A-R    407     (8)
T10_S1_X                         00000104-R    449     (8)
T10_S2                           0000010F-R    484     (9)
T10_S2_X                         000001B2-R    513     (9)
T10_S3                           000001BD-R    562     (10)
T10_S3_X                         000003A4-R    659     (10)
TABLE_T                          00000336-R    177     (4)       495     (9)
TEST_010                         00000010-R    375     (7)       375     (7)
TEST_010_X                       000003B2-R    661     (10)    #-380     (7)     #-493     (9)
TU58                            =00000002      88      (2)
T_DPATH_ERR                      0000007A-R    136     (3)       503     (9)
T_MARCH_ERR                      00000098-R    139     (3)       585     (10)      602     (10)      612     (10)      635     (10)
                                                                 645     (10)
T_MEM_ERR                        0000028B-R    163     (3)       262     (5)
T_MEM_MAP                        000002D6-R    167     (3)       434     (8)
T_NO_KA730                       00000029-R    130     (3)       379     (7)
T_NO_MEM_TST                     000000B8-R    142     (3)       492     (9)
T_SIZE_1_ERR                     00000126-R    148     (3)       297     (5)
T_SIZE_2_ERR                     000001E9-R    156     (3)       306     (5)
T_SIZ_ERR                        0000005F-R    133     (3)       447     (8)
T_UNXP_MC_ERR                    000000EC-R    145     (3)       264     (5)
UBI                             =0000000A      88      (2)
V_CHIP_SIZE                     =00000018      112     (2)     #-416     (8)
V_MAP_BIT                        00000014-R    99      (2)     #-567     (10)    #-577     (10)    #-578     (10)    #-593     (10)
                                                               #-619     (10)    #-620     (10)    #-653     (10)    #-654     (10)
V_MEM_ERR_FLAG                  =00000003      108     (2)
V_SB_ERR                        =00000018      110     (2)     #-485     (9)
V_UNXP_FLAG                     =00000001      106     (2)     #-256     (5)
WCS                             =00000007      88      (2)
```

```
                                     +-------------------------+
                                     ! Macros Cross Reference  !
                                     +-------------------------+
MACRO               SIZE            DEFINITION      REFERENCES...
-----               ----            ----------      -------------
$D1_BSUBT           1               407    (8)      407    (8)      484    (9)      562    (10)
$D1_BTEST           1               375    (7)      375    (7)
$D1_ERR             1               447    (8)      447    (8)      503    (9)      585    (10)     602    (10)     612    (10)
                                                    635    (10)     645    (10)
$D1_ERR_S           1               447    (8)      447    (8)      503    (9)      585    (10)     602    (10)     612    (10)
                                                    635    (10)     645    (10)
$D1_ESUBT           1               449    (8)      449    (8)      513    (9)      659    (10)
$D1_ETEST           1               661    (10)     661    (10)
$D1_EXTEST          1               380    (7)      380    (7)      493    (9)
$D1_PRINT_S         1               262    (5)      262    (5)      264    (5)      297    (5)      306    (5)      379    (7)
                                                    434    (8)      492    (9)
$D1_SBTTL           2               361    (7)      361    (7)      384    (8)      452    (9)      517    (10)
$D2_BDATA           1               375    (7)      375    (7)
$D2_BTEST           1               375    (7)      375    (7)
$D2_SBTTL           1               361    (7)      361    (7)
$DEF                1               87     (2)      79     (2)      80     (2)      85     (2)      86     (2)      87     (2)
$DEFEND             1               79     (2)      79     (2)      80     (2)      83     (2)      85     (2)      86     (2)
                                                    87     (2)
$DEFINI             1               79     (2)      79     (2)      80     (2)      83     (2)      85     (2)      86     (2)
                                                    87     (2)
$DS_BERROR          1               327    (6)      327    (6)
$DS_BGNMESSAGE      1               255    (5)      255    (5)      278    (5)
$DS_BGNMOD          1               67     (2)      67     (2)
$DS_BGNSUB          1               407    (8)      407    (8)      484    (9)      562    (10)
$DS_BGNTEST         1               375    (7)      375    (7)
$DS_BREAK           1               576    (10)     576    (10)     618    (10)     652    (10)     661    (10)
$DS_CKLOOP          1               505    (9)      505    (9)
$DS_CLRVEC_S        1               511    (9)      511    (9)      657    (10)
$DS_DSADEF          1               80     (2)      80     (2)
$DS_DSBDEF          1               80     (2)
$DS_DSDEF           2               81     (2)      81     (2)
$DS_DSSDEF          1               85     (2)      85     (2)
$DS_ENDDATA         1               375    (7)      375    (7)
$DS_ENDMESSAGE      1               267    (5)      267    (5)      308    (5)
$DS_ENDMOD          1               662    (10)     662    (10)
$DS_ENDSUB          1               449    (8)      449    (8)      513    (9)      659    (10)
$DS_ENDTEST         1               661    (10)     661    (10)
$DS_ENVDEF          2               67     (2)      67     (2)
$DS_ERRDEF          1               84     (2)      84     (2)
$DS_ERRHARD_S       1               445    (8)      445    (8)      500    (9)      583    (10)     599    (10)     609    (10)
                                                    632    (10)     642    (10)
$DS_EXIT            1               380    (7)      380    (7)      493    (9)
$DS_HPODEF          2               86     (2)      86     (2)
$DS_PAGE            1               358    (6)      358    (6)      382    (7)      450    (8)      515    (9)
$DS_PARDEF          1               82     (2)      82     (2)
$DS_PRINTB_S        1               292    (5)      292    (5)      302    (5)
$DS_PRINTF_S        1               379    (7)      379    (7)      431    (8)      492    (9)
$DS_PRINTSIG_G      1               265    (5)      265    (5)
$DS_PRINTX_S        1               258    (5)      258    (5)      264    (5)
$DS_PROBE_S         1               324    (6)      324    (6)
```

```
$DS_PSLDEF        1            83     (2)        83     (2)
$DS_SBTTL         1            361    (7)        361    (7)        384    (8)        452    (9)        517    (10)
$DS_SCBDEF        1            79     (2)        79     (2)
$DS_SECDEF        1            88     (2)        88     (2)
$DS_SETVEC_S      1            487    (9)        487    (9)        564    (10)
$EQU              1            87     (2)        67     (2)        81     (2)        82     (2)        83     (2)
$EQULS1           1            83     (2)        67     (2)        81     (2)        83     (2)
$EQULST           1            67     (2)        67     (2)        81     (2)        83     (2)
$GBLINI           2            67     (2)        67     (2)        79     (2)        80     (2)        81     (2)        82     (2)
                                                 83     (2)        85     (2)        86     (2)        87     (2)

$HP_DEFDEF        1            86     (2)
$KADEF            1            87     (2)
$OFFDEF           1            84     (2)        84     (2)
$PSLDEF           1            83     (2)        83     (2)
$PUSHADR          1            447    (8)        447    (8)        503    (9)        585    (10)       602    (10)       612    (10)
                                                 635    (10)       645    (10)
$VIELD            1            67     (2)        67     (2)        80     (2)        82     (2)        83     (2)        86     (2)
                                                 87     (2)
$VIELD1           1            87     (2)        67     (2)        80     (2)        82     (2)        83     (2)        86     (2)
                                                 87     (2)
ENKAX_SECDEF      1            88     (2)        88     (2)
KA_DEF            2            87     (2)        87     (2)


                                                 +--------------------------+
                                                 ! Performance indicators !
                                                 +--------------------------+
Phase                        Page faults    CPU Time          Elapsed Time
-----                        -----------    --------          ------------
Initialization                       25     00:00:00.05       00:00:00.15
Command processing                   22     00:00:00.19       00:00:00.51
Pass 1                             1098     00:00:14.88       00:00:19.93
Symbol table sort                     0     00:00:00.66       00:00:00.66
Pass 2                              340     00:00:02.96       00:00:06.26
Symbol table output                  60     00:00:00.37       00:00:00.79
Psect synopsis output                 5     00:00:00.04       00:00:00.04
Cross-reference output              243     00:00:02.11       00:00:05.21
Assembler run totals               1797     00:00:21.26       00:00:33.56

The working set limit was 900 pages.
115755 bytes (227 pages) of virtual memory were used to buffer the intermediate code.
There were 30 pages of symbol table space allocated to hold 463 non-local and 42 local symbols.
663 source lines were read in Pass 1, producing 27 object records in Pass 2.
123 pages of virtual memory were used to define 55 macros.

                                                +----------------------------+
                                                ! Macro library statistics !
                                                +----------------------------+
Macro library name                               Macros defined
------------------                               --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                                2
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                             45
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                             8
TOTALS (all libraries)                                       55

858 GETS were required to define 55 macros.
```

```
There were no errors, warnings or information messages.

/LIS/CRO ENKAXI
```

```
    (1)        1          ENKAXJ: FAST CONTROL STORE INTERRUPT
    (2)       57          DECLARATIONS
```

```
0000              .SBTTL  ENKAXJ: FAST CONTROL STORE INTERRUPT
0000              .TITLE  ENKAXJ  VAX-11/730 Specific CPU Cluster Exerciser
0000              .IDENT  /1-3/
0000
0000      ;
0000      ; Copyright (C) 1980
0000      ; Digital Equipment Corporation, Maynard, Massachusetts 01754
0000      ;
0000      ; This software is furnished  under a license for use only on a single
0000      ; computer  system and  may be  copied only with  the inclusion of the
0000      ; above copyright notice.  This software, or any other copies thereof,
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0000      ; Corporation.
0000      ;
0000      ; DEC assumes  no  responsibility  for  the use or  reliability of its
0000      ; software on equipment which is not supplied by DEC.
0000      ;
0000
0000      ;++
0000      ; Facility:       VAX Architecture Diagnostic.
0000      ;
0000      ; Abstract:       It was agreed at the Functional Specification Review that this
0000      ;                 module will not be implemented. The microcode requirements
0000      ;                 of the Fast Interrupt feature make testing this function not
0000      ;                 feasible. Possibly this issue could be addressed by IDC macro
0000      ;                 or micro diagnostics.
0000      ;
0000      ;
0000      ; Environment:    VAX Diagnostic Supervisor.
0000      ;
0000      ; Author:         Fred Roemer       22-Sep-80          Version 1X
0000      ;
0000      ;                 Tai-Chun Pan      01-Apr-83          Version 1.2
0000      ;
0000      ;                 Added quick flag on Test 7(TU58). If quick flag is set
0000      ;                 will skip subtest 4 through subtest 11.  Added event flag 3.
0000      ;                 If event flag 3 is set, will override protection,
0000      ;                 i.e., go ahead and write on tape.  If run APT & event flag 3
0000      ;                 is clear & tape is not scratch, will report an error.
0000      ;                 Modified Unibus sizer on Test 8 & 9. make test run faster.
0000      ;
0000      ;
0000      ;
0000      ;                 Tai-Chun Pan      03-Aug-83          Version 1.3
0000      ;
0000      ;                 fixed bugs on TEST 7 and error summary routine call when
0000      ;                 running under APT.
0000      ;
0000      ;--
```

```
                                   0000     57              .SBTTL  DECLARATIONS
                                   0000     58              .LIST   MEB
                                   0000     59              .NLIST  CND
                               00000000     60              .PSECT  ENKAXJ, PAGE, NOWRT
                                   0000     61              .LIBRARY        "SYS$LIBRARY:DIAG"      ; VAX family diagnostic library.
                                   0000     62              $DS_BGNMOD      CEP_REPAIR, TN=1
                                   0000        ;;;          Macro-32 Diagnostic macro library Version 6.10 'DIAG.MLB (137)"
                                   0000     63
                                   0000     64 ;
                                   0000     65 ; Include files:
                                   0000     66 ;
                                   0000     67
                                   0000     68              .LIBRARY        "ENKAX"         ; CPU Cluster Exerciser library.
%MACRO-E-MLBOPNERR, Error opening macro library             !
                                   0000
```

```
$$S             = FFFFFFFF
$ENV            = 00000001  G
$ER             = 00000001
$MO             = 00000000  G
$ST             = 00000000
$TN             = 00000001
BIT...          = 00000002
CEP_FUNCTIONAL  = 00000000
CEP_REPAIR      = 00000001
ENV$M_DOMAIN    = 00000002
ENV$M_LEVEL     = 00000001
ENV$M_SUPER     = 000003FC
ENV$S_DOMAIN    = 00000001
ENV$S_LEVEL     = 00000001
ENV$S_SUPER     = 00000008
ENV$V_DOMAIN    = 00000001
ENV$V_LEVEL     = 00000000
ENV$V_SUPER     = 00000002
ENV$_CPU        = 00000000
ENV$_FUNCTIONAL= 00000000
ENV$_REPAIR     = 00000001
ENV$_SUPER      = 00000001
ENV$_SYSTEM     = 00000001
SEP_FUNCTIONAL  = 00000002
SEP_REPAIR      = 00000003
SIZ...          = 00000008


                                                    +----------------+
                                                    ! Psect synopsis !
                                                    +----------------+

PSECT name                      Allocation          PSECT No.  Attributes
----------                      ----------          ---------  ----------
 .  ABS  .                      00000000  (     0.)  00 (   0.)  NOPIC    USR    CON    ABS    LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
 . BLANK .                      00000000  (     0.)  01 (   1.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
ENKAXJ                          00000000  (     0.)  02 (   2.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
```

```
                                            +-------------------------+
                                            ! Symbol Cross Reference !
                                            +-------------------------+
SYMBOL          VALUE           DEFINITION      REFERENCES...
------          -----           ----------      -------------
$$S             =FFFFFFFF       62      (2)
$ENV            =00000001       62      (2)
$ER             =00000001       62      (2)
$MO             =00000000       62      (2)
$ST             =00000000       62      (2)
$TN             =00000001       62      (2)
BIT...          =00000002       62      (2)     62      (2)
CEP_FUNCTIONAL  =00000000       62      (2)
CEP_REPAIR      =00000001       62      (2)     62      (2)
ENV$M_DOMAIN    =00000002       62      (2)
ENV$M_LEVEL     =00000001       62      (2)
ENV$M_SUPER     =000003FC       62      (2)
ENV$S_DOMAIN    =00000001       62      (2)
ENV$S_LEVEL     =00000001       62      (2)
ENV$S_SUPER     =00000008       62      (2)
ENV$V_DOMAIN    =00000001       62      (2)     62      (2)
ENV$V_LEVEL     =00000000       62      (2)     62      (2)
ENV$V_SUPER     =00000002       62      (2)
ENV$_CPU        =00000000       62      (2)     62      (2)
ENV$_FUNCTIONAL=00000000        62      (2)     62      (2)
ENV$_REPAIR     =00000001       62      (2)     62      (2)
ENV$_SUPER      =00000001       62      (2)
ENV$_SYSTEM     =00000001       62      (2)     62      (2)
SEP_FUNCTIONAL  =00000002       62      (2)
SEP_REPAIR      =00000003       62      (2)
SIZ...          =00000008       62      (2)     62      (2)
```

```
                                            +--------------------------+
                                            ! Macros Cross Reference !
                                            +--------------------------+
MACRO               SIZE           DEFINITION       REFERENCES...
-----               ----           ----------       -------------
$DEF                1              62      (2)
$DS_BGNMOD          1              62      (2)      62      (2)
$DS_ENVDEF          2              62      (2)      62      (2)
$EQU                1              62      (2)      62      (2)
$EQULS1             1              62      (2)      62      (2)
$EQULST             1              62      (2)      62      (2)
$GBLINI             2              62      (2)      62      (2)
$VIELD              1              62      (2)      62      (2)
$VIELD1             1              62      (2)      62      (2)

                                            +--------------------------+
                                            ! Performance indicators !
                                            +--------------------------+
Phase                      Page faults    CPU Time        Elapsed Time
-----                      -----------    --------        ------------
Initialization                     23     00:00:00.05     00:00:00.18
Command processing                 21     00:00:00.23     00:00:00.48
Pass 1                            331     00:00:01.30     00:00:02.06
Symbol table sort                   0     00:00:00.01     00:00:00.00
Pass 2                             66     00:00:00.27     00:00:00.49
Symbol table output                 5     00:00:00.03     00:00:00.03
Psect synopsis output               5     00:00:00.01     00:00:00.01
Cross-reference output             19     00:00:00.15     00:00:00.18
Assembler run totals              474     00:00:02.06     00:00:03.46

The working set limit was 450 pages.
9360 bytes (19 pages) of virtual memory were used to buffer the intermediate code.
There were 10 pages of symbol table space allocated to hold 26 non-local and 0 local symbols.
68 source lines were read in Pass 1, producing 0 object records in Pass 2.
17 pages of virtual memory were used to define 7 macros.

                                           +----------------------------+
                                           ! Macro library statistics !
                                           +----------------------------+
Macro library name                         Macros defined
------------------                         --------------
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                 2
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                3
TOTALS (all libraries)                           5

100 GETS were required to define 5 macros.

There were 1 error, 0 warnings and 0 information messages, on lines:
   68 (2)

/LIS/CRO ENKAXJ
```

```
;
;       MODULE ENKAXK (ident = '1.3') =
;       BEGIN
;       %TITLE 'ENKAX Privileged Instruction Ldpctx'            ! LDPCTX
;       ! ++
;       !
;       ! FACILITY :    VAX Architecture Diagnostic
;       !
;       ! ABSTRACT :    This module tests the process context switching instruction
;       !               (LDPCTX ,SRM chapter 7).
;       !
;       ! ENVIRONMENT : Stand-alone with VAX Diagnostic Supervisor
;       !
;       ! AUTHOR :      Kevin Martin            9-NOV-1982 Version 1
;       !
;       !               Tai-Chun Pan    01-Apr-83       Version 1.2
;       !
;       !               Added quick flag on Test 7(TU58). If quick flag is set
;       !               will skip subtest 4 through subtest 11.  Added event flag 3.
;       !               If event flag 3 is set, will override protection,
;       !               i.e., go ahead and write on tape.  If run APT & event flag 3
;       !               is clear & tape is not scratch, will report an error.
;       !
;       !               Modified Unibus sizer on Test 8 & 9. make test run faster.
;       !
;       !
;       !
;       !
;       ! --
;
;       ! ++
;       !       Module comments
;       !       This test may be run in Stand-alone mode ONLY, any attempt to
;       !       run in User mode will result in a test abort.
;       !       The ENKAXK and ENKAXL modules must be linked with other modules
;       !       for a successful run.  This test is not dependent on any other
;       !       test in ENKAX
;       ! --
;
;       LIBRARY
;           'SYS$LIBRARY:LIB';
;       LIBRARY
;           'SYS$LIBRARY:DIAG';
;
;       ! ENKAX library is for MACRO and is relatively useless here
;
;       LINKAGE
;           EX_LINK = JSB;
;
;       EXTERNAL ROUTINE
;           EXECUTE :  EX_LINK ADDRESSING_MODE (LONG_RELATIVE);
;
;       EXTERNAL
;           SAVE_RESULTS : ADDRESSING_MODE (LONG_RELATIVE);     ! Address where
;                                                               ! exception handler
;                                                               ! returns to in Execute
;
```

```
;        0058  ! Macro defs for DSA$V_USER
;        0059
;        0060      $DS_DSADEF
;        0061
;      L 0062  $DS_BGNMOD (ENV=CEP_REPAIR, TEST = 11);
; %PRINT:      Bliss-32 Diagnostic Macro Library version 6.10 "DIAG.L32 (45)"
;        0063
;        0064  %ASSIGN ($$$TN, $$$TN + 1)        ! Fake the effect of a BGNTEST in this module
;        0065      COMPILETIME
;        0066          $$$ERR = 1,               ! These are defined by BGNTEST, by defining
;        0067          $$$ST = 0,                ! them in this module we are able to use
;        0068          $$$ERROK = 1;             ! the DS error calls and subtest macros
;        0069
;        0070  LITERAL
;        0071      PTX$K_LENGTH = 96;
;        0072  MACRO
;        0073
;        0074  !   Define the PTX$L_x and MBZ PCB offsets as macro expansions.
;        0075
;        0076      PTX$L_KSP = 0, 0, 32, 0 %,            ! Define stack register offsets
;        0077      PTX$L_ESP = 4, 0, 32, 0 %,
;        0078      PTX$L_SSP = 8, 0, 32, 0 %,
;        0079      PTX$L_USP = 12, 0, 32, 0 %,
;        0080
;        0081      PTX$L_R0 = 16, 0, 32, 0 %,            ! Define general register offsets
;        0082      PTX$L_R1 = 20, 0, 32, 0 %,
;        0083      PTX$L_R2 = 24, 0, 32, 0 %,
;        0084      PTX$L_R3 = 28, 0, 32, 0 %,
;        0085      PTX$L_R4 = 32, 0, 32, 0 %,
;        0086      PTX$L_R5 = 36, 0, 32, 0 %,
;        0087      PTX$L_R6 = 40, 0, 32, 0 %,
;        0088      PTX$L_R7 = 44, 0, 32, 0 %,
;        0089      PTX$L_R8 = 48, 0, 32, 0 %,
;        0090      PTX$L_R9 = 52, 0, 32, 0 %,
;        0091      PTX$L_R10 = 56, 0, 32, 0 %,
;        0092      PTX$L_R11 = 60, 0, 32, 0 %,
;        0093      PTX$L_AP = 64, 0, 32, 0 %,
;        0094      PTX$L_FP = 68, 0, 32, 0 %,
;        0095
;        0096      PTX$L_P0BR = 80, 0, 32, 0 %,          ! Define mem management offsets
;        0097      PTX$V_P0LR = 84, 0, 22, 0 %,
;        0098      PTX$V_MBZ1 = 84, 22, 2, 0 %,          ! MBZ's are must be zero fields in
;        0099      PTX$V_MBZ2 = 84, 27, 5, 0 %,          ! in the PCB
;        0100      PTX$V_ASTLVL = 84, 24, 3, 0 %,        !
;        0101      PTX$L_P1BR = 88, 0, 32, 0 %,
;        0102      PTX$V_P1LR = 92, 0, 22, 0 %,
;        0103      PTX$V_MBZ3 = 92, 22, 9, 0 %,
;        0104      PTX$V_PME = 92, 31, 1, 0 %,
;        0105      PCB = BLOCK [96, BYTE] %;             ! The standard size PCB
;        0106
;        0107
;        0108  ! Declare variables
;        0109
;        0110  BIND
;        0111      NONE = $ASCIC ('None.'),                          ! Values of expected
;        0112      RESV_OPR = $ASCIC ('Reserved operand abort.'),    ! and actual exception
;        0113                                                        ! printed out in the
```

```
                                                            ! Print_err routine
! DS Error messages

    FAIL_LD_M = $ASCIC ('Fail on LDPCTX.') ,

! Subtest fail error messages

    SUB_MSG_1 = $ASCIC ('P0 Base Register high byte is not two.!/'),
    SUB_MSG_2 = $ASCIC ('P0 Base Register low bit is not zero.!/'),
    SUB_MSG_3 = $ASCIC ('Must Be zero field one, has all ones.!/'),
    SUB_MSG_4 = $ASCIC ('ASTLVL = 5, reserved to Digital.!/'),
    SUB_MSG_5 = $ASCIC ('P1 Base Register high byte not two.!/'),
    SUB_MSG_6 = $ASCIC ('P1 Base Register low bit not zero.!/');

GLOBAL
    ACTUAL_EXCEPT,                ! For passing the exception received, if any
                                  ! back from the handler and EXECUTE modules
    EXPECTED_EXCEPT,              ! Compared in main routine with ACTUAL_EXCEPT

    CHECK_STACK : BYTE,           ! Boolean, tells EXECUTE if resulting
                                  ! stacks should be checked for error.
    MODE : BYTE,                  ! Used in Execute, what mode is the
                                  ! instruction to be executed from
    PCB_ERR_FLAG : BITVECTOR [26],! There are 26 bits which correspond to
                                  !  the 26 data fields in a PCB, if there
                                  !  there is a discrepency between Actual_pcb
                                  !  and Expect_Pcb the appropriate bit is set.
    REG_ERR_FLAG : BITVECTOR [26],! Same as the PCB_Err_Flag, but applies to
                                  ! registers
    ORIG_PCBB,          ! Save the place of the Pcb the test disrupts
    REG_DATA : PCB,     ! Error free data used in testing a normal run
    INIT_PCB : PCB,     ! Used to initialize return PCBs with background.
    EXPECT_PCB : PCB,   ! What is expected in ACTUAL_PCB after execution.
    ACTUAL_PCB : PCB,   ! What the Pcb contains after execution

    INIT_REG : PCB,     ! Used to initialize the registers
    EXPECT_REG : PCB,   ! What the registers should look like after the
                        ! instruction
    ACTUAL_REG : PCB;   ! The contents of the registers after the instruction



! End variable declarations

! Subroutines

! Error Print Out Routine

$DS_BGNMESSAGE (ROUTINE_NAME = PRINT_ERR)
BIND
    BASIC_ERR_MSG = .P1,          ! Message to be printed in Basic Error Info
    EXPECTED_EXCEPT = P2,         ! Exception codes passed in
    ACTUAL_EXCEPT = P3;

MAP
    ACTUAL_PCB : VECTOR,          ! Make PCB's and Regs easier to index
    ACTUAL_REG : VECTOR,
;          0171            EXPECT_PCB : VECTOR,
;          0172            EXPECT_REG : VECTOR;
;          0173
;          0174            $DS_PRINTB (BASIC_ERR_MSG); ! Print basic error info
;          0175        !
;          0176        !   Print out longwords which do not match EXPECT_PCB
;          0177        !
;          0178            IF .PCB_ERR_FLAG NEQ 0 THEN
;          0179                BEGIN
;          0180        !
;          0181        !       Give PCB base address as Actual_Pcb's address
;          0182        !
;          0183                $DS_PRINTB ($ASCIC ('PCB starting at !XL.!/'),ACTUAL_PCB);
;          0184        !
;          0185        !       Print table header for error info
;          0186        !
;          0187                $DS_PRINTB ($ASCIC ('!_!_INITIAL!4* EXPECTED!3* ACTUAL!5* XOR!/'));
;          0188        !
;          0189        !
;          0190        !       Print all fields where there is a data discrepency, and if in
;          0191        !       extended error info mode, print all other fields as well.
;          0192        !
;          0193                INCR I FROM 0 TO 23 DO
;          0194                    BEGIN
;          0195                    MAP
;          0196                        ACTUAL_PCB : VECTOR,    ! Make it easier to index
;          0197                        EXPECT_PCB : VECTOR,
;          0198                        INIT_PCB : VECTOR;
;          0199        !
;          0200
;          0201                    IF .PCB_ERR_FLAG[.I] EQL 1 THEN
;        P 0202                        $DS_PRINTB ($ASCIC ('PCB + !ZB !_!XL!3* !XL!3* !XL!3* !XL!/'),
;        P 0203                        .I, .INIT_PCB [.I], .EXPECT_PCB [.I],
;          0204                        .ACTUAL_PCB [.I], (.EXPECT_PCB[.I] XOR .ACTUAL_PCB[.I]))
;          0205                    ELSE
;          0206        !
;          0207        !           If no error on this line print only when extended info is on
;          0208        !
;        P 0209                        $DS_PRINTX ($ASCIC ('PCB + !ZB !_!XL!3* !XL!3* !XL!/'),
;        P 0210                        .I, .INIT_PCB [.I], .EXPECT_PCB [.I],
;          0211                        .ACTUAL_PCB [.I]);
;          0212                    END
;          0213                END
;          0214            ELSE
;          0215                $DS_PRINTB ($ASCIC ('No Pcb data error encountered!/'));
;          0216        !
;          0217        !   Print register errors, if any
;          0218        !
;          0219            IF .REG_ERR_FLAG NEQ 0 THEN
;          0220                BEGIN
;          0221        !
;          0222        !       Tell user where to find copy of resultant registers
;          0223        !
;        P 0224                $DS_PRINTB ($ASCIC ('A copy of register contents  begins at !XL.!/'),
;          0225                    ACTUAL_REG);
;          0226        !
;          0227        !       Print table header for error info
```

```
!
        $DS_PRINTB ($ASCIC ('!_!_INITIAL!4* EXPECTED!3* ACTUAL!5* XOR!/'));
        INCR I FROM 0 TO 23 DO
            BEGIN
            MAP
                ACTUAL_REG : VECTOR,      ! Make the block easier to index
                EXPECT_REG : VECTOR,
                INIT_REG:VECTOR;
            IF .REG_ERR_FLAG[.I] EQL 1 THEN
                $DS_PRINTB ($ASCIC ('REG + !ZB !_!XL!3* !XL!3* !XL!3* !XL!/'),
                .I, .INIT_REG [.I], .EXPECT_REG [.I],
                .ACTUAL_REG [.I], (.EXPECT_REG [.I] XOR .ACTUAL_REG [.I]))
            ELSE
                $DS_PRINTX ($ASCIC ('REG + !ZB !_!XL!3* !XL!3* !XL!/'),
                .I, .INIT_REG [.I],
                .EXPECT_REG [.I], .ACTUAL_REG [.I])
            END;
        END                     ! End if Reg_Flag set
    ELSE
        $DS_PRINTB ($ASCIC ('No Register data error was encountered.!/'));
!
!
!   Print exception info
!
    $DS_PRINTB ($ASCIC ('!_Expected exception was !AC!/'),
                    .EXPECTED_EXCEPT);

    $DS_PRINTB ($ASCIC ('!_Exception received was !AC!/'),
                    .ACTUAL_EXCEPT);

$DS_ENDMESSAGE;
```

```
                                          .TITLE  ENKAXK ENKAX Privileged Instruction Ldpctx
                                          .IDENT  \1.3\

                                          .PSECT  GLOBALS,NOEXE,2

                                00000 ACTUAL_EXCEPT::
                                          .BLKB   4
                                00004 EXPECTED_EXCEPT::
                                          .BLKB   4
                                00008 CHECK_STACK::
                                          .BLKB   1
                                00009 MODE::  .BLKB   1
                                0000A         .BLKB   2
                                0000C PCB_ERR_FLAG::
                                          .BLKB   4
                                00010 REG_ERR_FLAG::
                                          .BLKB   4
                                00014 ORIG_PCBB::
                                          .BLKB   4
                                00018 REG_DATA::
                                          .BLKB   96
                                00078 INIT_PCB::
                                          .BLKB   96
                                000D8 EXPECT_PCB::
```

```
                                                                           .BLKB   96
                                                            00138 ACTUAL_PCB::
                                                                           .BLKB   96
                                                            00198 INIT_REG::
                                                                           .BLKB   96
                                                            001F8 EXPECT_REG::
                                                                           .BLKB   96
                                                            00258 ACTUAL_REG::
                                                                           .BLKB   96

                                                                           .PSECT  $PLIT$,NOWRT,NOEXE,2

                                    2E  65  6E  6F  4E  05  00000 P.AAA:   .ASCII  <5>\None.\                                     ;
61  72  65  70  6F  20  64  65  76  72  65  73  65  52  17  00006 P.AAB:   .ASCII  <23>\Reserved operand abort.\                  ;
                        2E  74  72  6F  62  61  20  64  6E  00015                                                                 :
58  54  43  50  44  4C  20  6E  6F  20  6C  69  61  46  0F  0001E P.AAC:   .ASCII  <15>\Fail on LDPCTX.\                          ;
                                                        2E  0002D                                                                 :
74  73  69  67  65  52  20  65  73  61  42  20  30  50  28  0002E P.AAD:   .ASCII  \(P0 Base Register high byte is not two.!\     ;
73  69  20  65  74  79  62  20  68  67  69  68  20  72  65  0003D                                                                 :
                    21  2E  6F  77  74  20  74  6F  6E  20  0004C                                                                 :
                                                        2F  00056          .ASCII  \/\                                            ;
74  73  69  67  65  52  20  65  73  61  42  20  30  50  27  00057 P.AAE:   .ASCII  \'P0 Base Register low bit is not zero.!/\     ;
6E  20  73  69  20  74  69  62  20  77  6F  6C  20  72  65  00066                                                                 :
                    2F  21  2E  6F  72  65  7A  20  74  6F  00075                                                                 :
66  20  6F  72  65  7A  20  65  42  20  74  73  75  4D  27  0007F P.AAF:   .ASCII  \'Must Be zero field one, has all ones.!/\     ;
61  20  73  61  68  20  2C  65  6E  6F  20  64  6C  65  69  0008E                                                                 :
                    2F  21  2E  73  65  6E  6F  20  6C  6C  0009D                                                                 :
65  72  20  2C  35  20  3D  20  4C  56  4C  54  53  41  22  000A7 P.AAG:   .ASCII  \"ASTLVL = 5, reserved to Digital.!/\          ;
74  69  67  69  44  20  6F  74  20  64  65  76  72  65  73  000B6                                                                 :
                                        2F  21  2E  6C  61  000C5                                                                 :
74  73  69  67  65  52  20  65  73  61  42  20  31  50  25  000CA P.AAH:   .ASCII  \%P1 Base Register high byte not two.!/\       ;
6F  6E  20  65  74  79  62  20  68  67  69  68  20  72  65  000D9                                                                 :
                            2F  21  2E  6F  77  74  20  74  000E8                                                                 :
74  73  69  67  65  52  20  65  73  61  42  20  31  50  24  000F0 P.AAI:   .ASCII  \$P1 Base Register low bit not zero.!/\        ;
20  74  6F  6E  20  74  69  62  20  77  6F  6C  20  72  65  000FF                                                                 :
                                2F  21  2E  6F  72  65  7A  0010E                                                                 :
61  20  67  6E  69  74  72  61  74  73  20  42  43  50  16  00115 P.AAJ:   .ASCII  <22>\PCB starting at !XL.!/\                   ;
                            2F  21  2E  4C  58  21  20  74  00124                                                                 :
2A  34  21  4C  41  49  54  49  4E  49  5F  21  5F  21  2A  0012C P.AAK:   .ASCII  \*!_!_INITIAL!4* EXPECTED!3* ACTUAL!5* XO\     ;
43  41  20  2A  33  21  44  45  54  43  45  50  58  45  20  0013B                                                                 :
                    4F  58  20  2A  35  21  4C  41  55  54  0014A                                                                 :
                                                2F  21  52  00154          .ASCII  \R!/\                                          ;
58  21  5F  21  20  42  5A  21  20  2B  20  42  43  50  26  00157 P.AAL:   .ASCII  \&PCB + !ZB !_!XL!3* !XL!3* !XL!3* !XL!/\      ;
4C  58  21  20  2A  33  21  4C  58  21  20  2A  33  21  4C  00166                                                                 :
                        2F  21  4C  58  21  20  2A  33  21  00175                                                                 :
58  21  5F  21  20  42  5A  21  20  2B  20  42  43  50  1F  0017E P.AAM:   .ASCII  <31>\PCB + !ZB !_!XL!3* !XL!3* !XL!/\          ;
4C  58  21  20  2A  33  21  4C  58  21  20  2A  33  21  4C  0018D                                                                 :
                                                    2F  21  0019C                                                                 :
72  65  20  61  74  61  64  20  62  63  50  20  6F  4E  1F  0019E P.AAN:   .ASCII  <31>\No Pcb data error encountered!/\          ;
64  65  72  65  74  6E  75  6F  63  6E  65  20  72  6F  72  001AD                                                                 :
                                                    2F  21  001BC                                                                 :
69  67  65  72  20  66  6F  20  79  70  6F  63  20  41  2D  001BE P.AAO:   .ASCII  \-A copy of register contents  begins at \     ;
20  20  73  74  6E  65  74  6E  6F  63  20  72  65  74  73  001CD                                                                 :
                    20  74  61  20  73  6E  69  67  65  62  001DC                                                                 :
                                    2F  21  2E  4C  58  21  001E6          .ASCII  \!XL.!/\                                       ;
2A  34  21  4C  41  49  54  49  4E  49  5F  21  5F  21  2A  001EC P.AAP:   .ASCII  \*!_!_INITIAL!4* EXPECTED!3* ACTUAL!5* XO\     ;
43  41  20  2A  33  21  44  45  54  43  45  50  58  45  20  001FB                                                                 :
```

```
                    4F  58  20  2A  35  21  4C  41  55  54  0020A                                                        ;
                                                2F  21  52  00214          .ASCII  \R!/\                                  ;
58  21  5F  21  20  42  5A  21  20  2B  20  47  45  52  26  00217 P.AAQ:   .ASCII  \&REG + !ZB !_!XL!3* !XL!3* !XL!3* !XL!/\  ;
4C  58  21  20  2A  33  21  4C  58  21  20  2A  33  21  4C  00226                                                        ;
                        2F  21  4C  58  21  20  2A  33  21  00235                                                        ;
58  21  5F  21  20  42  5A  21  20  2B  20  47  45  52  1F  0023E P.AAR:   .ASCII  <31>\REG + !ZB !_!XL!3* !XL!3* !XL!/\    ;
4C  58  21  20  2A  33  21  4C  58  21  20  2A  33  21  4C  0024D                                                        ;
                                                    2F  21  0025C                                                        ;
61  64  20  72  65  74  73  69  67  65  52  20  6F  4E  29  0025E P.AAS:   .ASCII  \)No Register data error was encountered.\ ;
6E  65  20  73  61  77  20  72  6F  72  72  65  20  61  74  0026D                                                        ;
                    2E  64  65  72  65  74  6E  75  6F  63  0027C                                                        ;
                                                    2F  21  00286          .ASCII  \!/\                                   ;
63  78  65  20  64  65  74  63  65  70  78  45  5F  21  1E  00288 P.AAT:   .ASCII  <30>\!_Expected exception was !AC!/\   ;
21  43  41  21  20  73  61  77  20  6E  6F  69  74  70  65  00297                                                        ;
                                                        2F  002A6                                                        ;
65  72  20  6E  6F  69  74  70  65  63  78  45  5F  21  1E  002A7 P.AAU:   .ASCII  <30>\!_Exception received was !AC!/\   ;
21  43  41  21  20  73  61  77  20  64  65  76  69  65  63  002B6                                                        ;
                                                        2F  002C5                                                        ;

                                                                  DSA$AL_APTMAIL=      65024
                                                                  DSA$GL_FLAGS=        65024
                                                                  DSA$GL_APTCOM=       65028
                                                                  DSA$GL_PASSES=       65032
                                                                  DSA$GL_UNITS=        65036
                                                                  DSA$GL_SECTNO=       65040
                                                                  DSA$GL_SID=          65044
                                                                  DSA$GL_MSGTYP=       65088
                                                                  DSA$GL_ERRNO=        65092
                                                                  DSA$GL_EVENT=        65096
                                                                  DSA$GL_SUBTNO=       65100
                                                                  DSA$GL_TESTNO=       65104
                                                                  DSA$GL_PASSNO=       65108
                                                                  DSA$GL_DEVLEN=       65112
                                                                  DSA$GL_DEVNAM=       65116
                                                                  DSA$GL_MSGPTR=       65128
                                                                  NONE=                P.AAA
                                                                  RESV_OPR=            P.AAB
                                                                  FAIL_LD_M=           P.AAC
                                                                  SUB_MSG_1=           P.AAD
                                                                  SUB_MSG_2=           P.AAE
                                                                  SUB_MSG_3=           P.AAF
                                                                  SUB_MSG_4=           P.AAG
                                                                  SUB_MSG_5=           P.AAH
                                                                  SUB_MSG_6=           P.AAI
                                                                           .EXTRN  EXECUTE, SAVE_RESULTS
                                                                           .EXTRN  DS$PRINTB, DS$PRINTX

                                                                           .PSECT  CODE,NOWRT,2

                                                      007C  00000          .ENTRY  PRINT_ERR, Save R2,R3,R4,R5,R6            ; 0162
                                        56 00000000G  9F  9E  00002        MOVAB   @#DS$PRINTX, R6                           ;
                                        55     0000'  CF  9E  00009        MOVAB   PCB_ERR_FLAG, R5                          ;
                                        54 00000000G  9F  9E  0000E        MOVAB   @#DS$PRINTB, R4                           ;
                                                  14  AC  DD  00015        PUSHL   P1                                        ; 0174
                                        64            01  FB  00018        CALLS   #1, DS$PRINTB                             ;
                                                      65  D5  0001B        TSTL    PCB_ERR_FLAG                              ; 0178
                                                      58  13  0001D        BEQL    4$                                        ;
```

```
                                012C   C5 9F 0001F      PUSHAB  ACTUAL_PCB                      ; 0183
                               0000'   CF 9F 00023      PUSHAB  P.AAJ                           ;
                          64           02 FB 00027      CALLS   #2, DS$PRINTB                   ;
                               0000'   CF 9F 0002A      PUSHAB  P.AAK                           ; 0187
                          64           01 FB 0002E      CALLS   #1, DS$PRINTB                   ;
                                       52 D4 00031      CLRL    I                               ; 0193
                          53    00CC C542 D0 00033 1$:  MOVL    EXPECT_PCB[I], R3               ; 0204
                          51    012C C542 D0 00039      MOVL    ACTUAL_PCB[I], R1               ;
50            65          01           52 EF 0003F      EXTZV   I, #1, PCB_ERR_FLAG, R0         ; 0201
                          01           50 D1 00044      CMPL    R0, #1                          ;
                                       17 12 00047      BNEQ    2$                              ;
              7E          53           51 CD 00049      XORL3   R1, R3, -(SP)                   ; 0204
                                       51 DD 0004D      PUSHL   R1                              ;
                                       53 DD 0004F      PUSHL   R3                              ;
                                  6C A542 DD 00051      PUSHL   INIT_PCB[I]                     ;
                                       52 DD 00055      PUSHL   I                               ;
                               0000'   CF 9F 00057      PUSHAB  P.AAL                           ;
                          64           06 FB 0005B      CALLS   #6, DS$PRINTB                   ;
                                       11 11 0005E      BRB     3$                              ; 0201
                                       51 DD 00060 2$:  PUSHL   R1                              ; 0211
                                       53 DD 00062      PUSHL   R3                              ;
                                  6C A542 DD 00064      PUSHL   INIT_PCB[I]                     ;
                                       52 DD 00068      PUSHL   I                               ;
                               0000'   CF 9F 0006A      PUSHAB  P.AAM                           ;
                          66           05 FB 0006E      CALLS   #5, DS$PRINTX                   ;
              BE          52           17 F3 00071 3$:  AOBLEQ  #23, I, 1$                      ; 0193
                                       07 11 00075      BRB     5$                              ; 0178
                               0000'   CF 9F 00077 4$:  PUSHAB  P.AAN                           ; 0215
                          64           01 FB 0007B      CALLS   #1, DS$PRINTB                   ;
                                  04   A5 D5 0007E 5$:  TSTL    REG_ERR_FLAG                    ; 0219
                                       5B 13 00081      BEQL    9$                              ;
                                024C   C5 9F 00083      PUSHAB  ACTUAL_REG                      ; 0225
                               0000'   CF 9F 00087      PUSHAB  P.AAO                           ;
                          64           02 FB 0008B      CALLS   #2, DS$PRINTB                   ;
                               0000'   CF 9F 0008E      PUSHAB  P.AAP                           ; 0229
                          64           01 FB 00092      CALLS   #1, DS$PRINTB                   ;
                                       52 D4 00095      CLRL    I                               ; 0230
                          53    01EC C542 D0 00097 6$:  MOVL    EXPECT_REG[I], R3               ; 0239
                          51    024C C542 D0 0009D      MOVL    ACTUAL_REG[I], R1               ;
50      04    A5          01           52 EF 000A3      EXTZV   I, #1, REG_ERR_FLAG, R0         ; 0236
                          01           50 D1 000A9      CMPL    R0, #1                          ;
                                       18 12 000AC      BNEQ    7$                              ;
              7E          53           51 CD 000AE      XORL3   R1, R3, -(SP)                   ; 0239
                                       51 DD 000B2      PUSHL   R1                              ;
                                       53 DD 000B4      PUSHL   R3                              ;
                                018C C542 DD 000B6      PUSHL   INIT_REG[I]                     ;
                                       52 DD 000BB      PUSHL   I                               ;
                               0000'   CF 9F 000BD      PUSHAB  P.AAQ                           ;
                          64           06 FB 000C1      CALLS   #6, DS$PRINTB                   ;
                                       12 11 000C4      BRB     8$                              ; 0231
                                       51 DD 000C6 7$:  PUSHL   R1                              ; 0243
                                       53 DD 000C8      PUSHL   R3                              ;
                                018C C542 DD 000CA      PUSHL   INIT_REG[I]                     ;
                                       52 DD 000CF      PUSHL   I                               ;
                               0000'   CF 9F 000D1      PUSHAB  P.AAR                           ;
                          66           05 FB 000D5      CALLS   #5, DS$PRINTX                   ;
              BB          52           17 F3 000D8 8$:  AOBLEQ  #23, I, 6$                      ; 0230
```

```
                                  07  11 000DC          BRB      10$                                          ; 0219
                         0000'    CF  9F 000DE 9$:      PUSHAB   P.AAS                                        ; 0247
                  64              01  FB 000E2          CALLS    #1, DS$PRINTB                                ;
                            18    AC  DD 000E5 10$:     PUSHL    EXPECTED_EXCEPT                              ; 0253
                         0000'    CF  9F 000E8          PUSHAB   P.AAT                                        ;
                  64              02  FB 000EC          CALLS    #2, DS$PRINTB                                ;
                            1C    AC  DD 000EF          PUSHL    ACTUAL_EXCEPT                                ; 0256
                         0000'    CF  9F 000F2          PUSHAB   P.AAU                                        ;
                  64              02  FB 000F6          CALLS    #2, DS$PRINTB                                ;
                                      04 000F9          RET                                                   ; 0162

; Routine Size:  250 bytes,    Routine Base:  CODE + 0000

;         0259
;         0260   ! Exception Handler
;         0261
;         0262   GLOBAL ROUTINE HANDLER (sig : ref vector, mech) =
;         0263       BEGIN
;         0264       GLOBAL
;         0265           ACTUAL_PSL,
;         0266           OPR_ABORT;
;         0267       EXTERNAL
;         0268           TEMP_PSL;
;         0269       MAP
;         0270           MECH : REF BLOCK [, BYTE];      ! Make it byte addressable
;         0271                                           ! to satisfy macro defined
;         0272                                           ! in library
;         0273
;         0274
;         0275       OPR_ABORT = 0;                  ! Initialize abort flag
;         0276       ACTUAL_PSL = .SIG [3];          ! Send back the PSL received after
;         0277                                       ! instruction execution
;         0278       SELECTONE 1 OF                  ! Only one exception code will be valid
;         0279           SET
;         0280             [ .SIG [1] EQL SS$_ROPRAND] :
;         0281   !
;         0282   !                 The  exception is passed to the main routine
;         0283   !                 implicitly in ACTUAL_EXCEPT
;         0284   !
;         0285             BEGIN
;         0286                   ACTUAL_EXCEPT =  RESV_OPR;
;         0287                   OPR_ABORT = 1;  ! Set exception flag
;         0288             END;
;         0289   !
;         0290   ! ACTUAL_EXCEPT remains None if this handler is called because of BPT instruction
;         0291   !
;         0292             [ .SIG [1] EQL SS$_BREAK] :
;         0293                   ACTUAL_EXCEPT =  NONE;
;         0294
;         0295             [OTHERWISE] :
;         0296   !
;         0297   !       If it is not an exception normally obtained from a LDPCTX or SVPCTX
;         0298   !
;         0299                   RETURN SS$_RESIGNAL ! Something unexpected occured, tell DS to
;         0300                                       ! take care of it
;         0301           TES;
;         0302      .MECH [CHF$L_MCH_FRAME] = 0;     !  Disable handler.
;         0303
;         0304      SIG [2] = SAVE_RESULTS;      ! Restore PC to return to Execute at Save_Results
;         0305      SS$_CONTINUE
;         0306      END;                         ! End of Exception Handler



                                                                           .PSECT   GLOBALS,NOEXE,2

                                                             002B8 ACTUAL_PSL::
                                                                           .BLKB    4
                                                             002BC OPR_ABORT::
                                                                           .BLKB    4

                                                                           .EXTRN   TEMP_PSL

                                                                           .PSECT   CODE,NOWRT,2

                                                        0000 00000         .ENTRY   HANDLER, Save nothing                        ; 0262
                                               0000'  CF  D4 00002         CLRL     OPR_ABORT                                    ; 0275
                                        51        04  AC  D0 00006         MOVL     SIG, R1                                      ; 0276
                                 0000'  CF        0C  A1  D0 0000A         MOVL     12(R1), ACTUAL_PSL                           ;
                              00000454  8F        04  A1  D1 00010         CMPL     4(R1), #1108                                 ; 0280
                                                      0E  12 00018         BNEQ     1$                                           ;
                                 0000'  CF     0000'  CF  9E 0001A         MOVAB    RESV_OPR, ACTUAL_EXCEPT                      ; 0285
                                 0000'  CF            01  D0 00021         MOVL     #1, OPR_ABORT                                ; 0287
                                                      19  11 00026         BRB      3$                                           ; 0278
                              00000414  8F        04  A1  D1 00028 1$:     CMPL     4(R1), #1044                                 ; 0292
                                                      09  12 00030         BNEQ     2$                                           ;
                                 0000'  CF     0000'  CF  9E 00032         MOVAB    NONE, ACTUAL_EXCEPT                          ; 0278
                                                      06  11 00039         BRB      3$                                           ;
                                        50      0918  8F  3C 0003B 2$:     MOVZWL   #2328, R0                                    ; 0299
                                                          04 00040         RET                                                   ;
                                        50        08  AC  D0 00041 3$:     MOVL     MECH, R0                                     ; 0302
                                                  04  B0  D4 00045         CLRL     @4(R0)                                       ;
                                    08  A1 00000000G  EF  9E 00048         MOVAB    SAVE_RESULTS, 8(R1)                          ; 0304
                                        50            01  D0 00050         MOVL     #1, R0                                       ; 0262
                                                          04 00053         RET                                                   ;

; Routine Size:  84 bytes,    Routine Base:  CODE + 00FA


;         0307  !
;         0308  ! Compare PCB routine
;         0309  !
;         0310  ROUTINE COMPARE_PCB : NOVALUE =
;         0311  ! Compares Actual_Pcb against Expect_Pcb and Actual_Regs against Expect_Regs
;         0312  ! and sets Pcb_Err_Flag and/or Reg_Err_Flag, respectively, if any data
;         0313  ! discrepency is discovered.  For example if Actual_Pcb[R0] does not
;         0314  ! correspond with Expect_Pcb[R0] then Pcb_Err_Flag bit four is set, because
;         0315  ! R0 is the fourth data field in a PCB.
;         0316
;         0317  BEGIN
;         0318  PCB_ERR_FLAG = 0;                ! Begin with no errors
;         0319  REG_ERR_FLAG = 0;
;         0320
;       !
;       !
;           SELECT 1 OF
;               SET
;       !
;       !       Do not check Ksp in the Pcb, it probably won't be the same
;       !       as in Expect_Pcb
;       !
;               [.ACTUAL_PCB [PTX$L_ESP] NEQ .EXPECT_PCB [PTX$L_ESP]] :
;                       PCB_ERR_FLAG [1] = 1;
;
;               [.ACTUAL_PCB [PTX$L_SSP] NEQ .EXPECT_PCB [PTX$L_SSP]] :
;                       PCB_ERR_FLAG [2] = 1;
;
;               [.ACTUAL_PCB [PTX$L_USP] NEQ .EXPECT_PCB [PTX$L_USP]] :
;                       PCB_ERR_FLAG [3] = 1
;               TES;
;
;       ! Check the general registers saved in the PCB
;
;           INCR I FROM 4 TO 16 DO
;               BEGIN
;               MAP
;                   ACTUAL_PCB : VECTOR,        ! Make it easier to reference longwds
;                   EXPECT_PCB : VECTOR;
;       !
;       !       Check each longword in the PCB from R0 to AP against the expected
;       !       value. Expect_Pcb [FP] probably is not correct.
;       !
;               IF .ACTUAL_PCB [.I] NEQ .EXPECT_PCB [.I] THEN
;                   PCB_ERR_FLAG [.I] = 1
;               END;
;
;       ! Check memory management data fields
;
;           IF .CHECK_STACK GEQ 2 THEN
;               SELECT 1 OF
;                   SET
;                   [.ACTUAL_PCB [PTX$L_P0BR] NEQ .EXPECT_PCB [PTX$L_P0BR]] :
;                       PCB_ERR_FLAG [18] = 1;
;
;                   [.ACTUAL_PCB [PTX$V_P0LR] NEQ .EXPECT_PCB [PTX$V_P0LR]] :
;                       PCB_ERR_FLAG [19] = 1;
;
;                   [.ACTUAL_PCB [PTX$V_MBZ1] NEQ 0] :
;                       PCB_ERR_FLAG [20] = 1;
;
;                   [.ACTUAL_PCB [PTX$V_ASTLVL] NEQ .EXPECT_PCB [PTX$V_ASTLVL]] :
;                       PCB_ERR_FLAG [21] = 1;
;
;                   [.ACTUAL_PCB [PTX$V_MBZ2] NEQ 0] :
;                       PCB_ERR_FLAG [22] = 1;
;
;                   [.ACTUAL_PCB [PTX$L_P1BR] NEQ .EXPECT_PCB [PTX$L_P1BR]] :
;                       PCB_ERR_FLAG [23] = 1;
;
;                   [.ACTUAL_PCB [PTX$V_P1LR] NEQ .EXPECT_PCB [PTX$V_P1LR]] :
```

```
                PCB_ERR_FLAG [24] = 1;

            [.ACTUAL_PCB [PTX$V_MBZ3] NEQ 0] :
                PCB_ERR_FLAG [25] = 1;

            [.ACTUAL_PCB [PTX$V_PME] NEQ .EXPECT_PCB [PTX$V_PME]] :
                PCB_ERR_FLAG [26] = 1;
            TES;
!
! End of PCB check
!

!
! Now check if registers got everything they were supposed to
!
    SELECT 1 OF
        SET
!
        The Ksp in the registers should be correct
!
        [.ACTUAL_REG [PTX$L_KSP] NEQ .EXPECT_REG [PTX$L_KSP]] :
                REG_ERR_FLAG [0] = 1;

        [.ACTUAL_REG [PTX$L_ESP] NEQ .EXPECT_REG [PTX$L_ESP]] :
                REG_ERR_FLAG [1] = 1;

        [.ACTUAL_REG [PTX$L_SSP] NEQ .EXPECT_REG [PTX$L_SSP]] :
                REG_ERR_FLAG [2] = 1;

        [.ACTUAL_REG [PTX$L_USP] NEQ .EXPECT_REG [PTX$L_USP]] :
                REG_ERR_FLAG [3] = 1
        TES;

! Check the general registers saved in the REG

        INCR I FROM 4 TO 16 DO          ! R0 to AP
            BEGIN
            MAP
                ACTUAL_REG : VECTOR,    ! Make it easy to compare longword
                EXPECT_REG : VECTOR;    ! offsets
!
        Check all resulting general registers against expected values
!
            IF .ACTUAL_REG [.I] NEQ .EXPECT_REG [.I] THEN
                REG_ERR_FLAG [.I] = 1
            END;

! Check memory management data fields

    SELECT 1 OF
        SET
        [.ACTUAL_REG [PTX$L_P0BR] NEQ .EXPECT_REG [PTX$L_P0BR]] :
                REG_ERR_FLAG [18] = 1;

        [.ACTUAL_REG [PTX$V_P0LR] NEQ .EXPECT_REG [PTX$V_P0LR]] :
                REG_ERR_FLAG [19] = 1;

```

```
;         0435  !       Skip MBZ bits, they don't exist in hardware, but wish to keep
;         0436  !       consistant with Pcb_Err_Flag
;         0437
;         0438          [.ACTUAL_REG [PTX$V_ASTLVL] NEQ .EXPECT_REG [PTX$V_ASTLVL]] :
;         0439                  REG_ERR_FLAG [21] = 1;
;         0440
;         0441          [.ACTUAL_REG [PTX$L_P1BR] NEQ .EXPECT_REG [PTX$L_P1BR]] :
;         0442                  REG_ERR_FLAG [23] = 1;
;         0443
;         0444          [.ACTUAL_REG [PTX$V_P1LR] NEQ .EXPECT_REG [PTX$V_P1LR]] :
;         0445                  REG_ERR_FLAG [24] = 1;
;         0446
;         0447          [.ACTUAL_REG [PTX$V_PME] NEQ .EXPECT_REG [PTX$V_PME]] :
;         0448                  REG_ERR_FLAG [26] = 1;
;         0449
;         0450          TES;
;         0451
;         0452  ! End of REG check, end of Compare routine
;         0453
;         0454  END;
```

```
                                                    0004    00000 COMPARE_PCB:
                                                                          .WORD   Save R2                                      ; 0310
                                        52    0000'   CF 9E 00002         MOVAB   PCB_ERR_FLAG, R2                             ;
                                                      62 7C 00007         CLRQ    PCB_ERR_FLAG                                 ; 0318
                                00D0    C2     0130   C2 D1 00009         CMPL    ACTUAL_PCB+4, EXPECT_PCB+4                   ; 0329
                                                      03 13 00010         BEQL    1$                                           ;
                                        62            02 88 00012         BISB2   #2, PCB_ERR_FLAG                             ; 0330
                                00D4    C2     0134   C2 D1 00015 1$:     CMPL    ACTUAL_PCB+8, EXPECT_PCB+8                   ; 0332
                                                      03 13 0001C         BEQL    2$                                           ;
                                        62            04 88 0001E         BISB2   #4, PCB_ERR_FLAG                             ; 0333
                                00D8    C2     0138   C2 D1 00021 2$:     CMPL    ACTUAL_PCB+12, EXPECT_PCB+12                 ; 0335
                                                      03 13 00028         BEQL    3$                                           ;
                                        62            08 88 0002A         BISB2   #8, PCB_ERR_FLAG                             ; 0336
                                        50            04 D0 0002D 3$:     MOVL    #4, I                                        ; 0341
                                00CC  C240     012C C240 D1 00030 4$:     CMPL    ACTUAL_PCB[I], EXPECT_PCB[I]                 ; 0350
                                                      04 13 00039         BEQL    5$                                           ;
                          00            62            50 E2 0003B         BBSS    I, PCB_ERR_FLAG, 5$                          ; 0351
                          ED            50            10 F3 0003F 5$:     AOBLEQ  #16, I, 4$                                   ; 0341
                                        02       FC   A2 91 00043         CMPB    CHECK_STACK, #2                              ; 0356
                                                      03 1E 00047         BGEQU   6$                                           ;
                                                    0091 31 00049         BRW     15$                                          ;
                                011C    C2     017C   C2 D1 0004C 6$:     CMPL    ACTUAL_PCB+80, EXPECT_PCB+80                 ; 0359
                                                      04 13 00053         BEQL    7$                                           ;
                                  02    A2            04 88 00055         BISB2   #4, PCB_ERR_FLAG+2                           ; 0360
          50      0120    C2            16            00 EF 00059 7$:     EXTZV   #0, #22, EXPECT_PCB+84, R0                   ; 0362
          50      0180    C2            16            00 ED 00060         CMPZV   #0, #22, ACTUAL_PCB+84, R0                   ;
                                                      04 13 00067         BEQL    8$                                           ;
                                  02    A2            08 88 00069         BISB2   #8, PCB_ERR_FLAG+2                           ; 0363
                                  C0    8F     0182   C2 93 0006D 8$:     BITB    ACTUAL_PCB+86, #192                          ; 0365
                                                      04 13 00073         BEQL    9$                                           ;
                                  02    A2            10 88 00075         BISB2   #16, PCB_ERR_FLAG+2                          ; 0366
          50      0123    C2            03            00 EF 00079 9$:     EXTZV   #0, #3, EXPECT_PCB+87, R0                    ; 0368
```

```
            50     0183  C2                  03            00 ED 00080         CMPZV   #0, #3, ACTUAL_PCB+87, R0       ;
                                                           04 13 00087         BEQL    10$                             ;
                                        02   A2            20 88 00089         BISB2   #32, PCB_ERR_FLAG+2             ; 0369
                                        F8   8F     0183   C2 93 0008D 10$:    BITB    ACTUAL_PCB+87, #248             ; 0371
                                                           05 13 00093         BEQL    11$                             ;
                                        02   A2       40   8F 88 00095         BISB2   #64, PCB_ERR_FLAG+2             ; 0372
                                      0124   C2     0184   C2 D1 0009A 11$:    CMPL    ACTUAL_PCB+88, EXPECT_PCB+88    ; 0374
                                                           05 13 000A1         BEQL    12$                             ;
                                        02   A2       80   8F 88 000A3         BISB2   #128, PCB_ERR_FLAG+2            ; 0375
            50     0128  C2                  16            00 EF 000A8 12$:    EXTZV   #0, #22, EXPECT_PCB+92, R0      ; 0377
            50     0188  C2                  16            00 ED 000AF         CMPZV   #0, #22, ACTUAL_PCB+92, R0      ;
                                                           04 13 000B6         BEQL    13$                             ;
                                        03   A2            01 88 000B8         BISB2   #1, PCB_ERR_FLAG+3              ; 0378
                                      7FC0   8F     018A   C2 B3 000BC 13$:    BITW    ACTUAL_PCB+94, #32704           ; 0380
                                                           04 13 000C3         BEQL    14$                             ;
                                        03   A2            02 88 000C5         BISB2   #2, PCB_ERR_FLAG+3              ; 0381
            50     012B  C2                  01            07 EF 000C9 14$:    EXTZV   #7, #1, EXPECT_PCB+95, R0       ; 0383
            50     018B  C2                  01            07 ED 000D0         CMPZV   #7, #1, ACTUAL_PCB+95, R0       ;
                                                           04 13 000D7         BEQL    15$                             ;
                                        03   A2            04 88 000D9         BISB2   #4, PCB_ERR_FLAG+3              ; 0384
                                      01EC   C2     024C   C2 D1 000DD 15$:    CMPL    ACTUAL_REG, EXPECT_REG          ; 0398
                                                           04 13 000E4         BEQL    16$                             ;
                                        04   A2            01 88 000E6         BISB2   #1, REG_ERR_FLAG                ; 0399
                                      01F0   C2     0250   C2 D1 000EA 16$:    CMPL    ACTUAL_REG+4, EXPECT_REG+4      ; 0401
                                                           04 13 000F1         BEQL    17$                             ;
                                        04   A2            02 88 000F3         BISB2   #2, REG_ERR_FLAG                ; 0402
                                      01F4   C2     0254   C2 D1 000F7 17$:    CMPL    ACTUAL_REG+8, EXPECT_REG+8      ; 0404
                                                           04 13 000FE         BEQL    18$                             ;
                                        04   A2            04 88 00100         BISB2   #4, REG_ERR_FLAG                ; 0405
                                      01F8   C2     0258   C2 D1 00104 18$:    CMPL    ACTUAL_REG+12, EXPECT_REG+12    ; 0407
                                                           04 13 0010B         BEQL    19$                             ;
                                        04   A2            08 88 0010D         BISB2   #8, REG_ERR_FLAG                ; 0408
                                             50            04 D0 00111 19$:    MOVL    #4, I                           ; 0413
                                      01EC C240     024C C240 D1 00114 20$:    CMPL    ACTUAL_REG[I], EXPECT_REG[I]    ; 0421
                                                           05 13 0011D         BEQL    21$                             ;
                         00             04   A2            50 E2 0011F         BBSS    I, REG_ERR_FLAG, 21$            ; 0422
                         EC                  50            10 F3 00124 21$:    AOBLEQ  #16, I, 20$                     ; 0413
                                      023C   C2     029C   C2 D1 00128         CMPL    ACTUAL_REG+80, EXPECT_REG+80    ; 0429
                                                           04 13 0012F         BEQL    22$                             ;
                                        06   A2            04 88 00131         BISB2   #4, REG_ERR_FLAG+2              ; 0430
            50     0240  C2                  16            00 EF 00135 22$:    EXTZV   #0, #22, EXPECT_REG+84, R0      ; 0432
            50     02A0  C2                  16            00 ED 0013C         CMPZV   #0, #22, ACTUAL_REG+84, R0      ;
                                                           04 13 00143         BEQL    23$                             ;
                                        06   A2            08 88 00145         BISB2   #8, REG_ERR_FLAG+2              ; 0433
            50     0243  C2                  03            00 EF 00149 23$:    EXTZV   #0, #3, EXPECT_REG+87, R0       ; 0438
            50     02A3  C2                  03            00 ED 00150         CMPZV   #0, #3, ACTUAL_REG+87, R0       ;
                                                           04 13 00157         BEQL    24$                             ;
                                        06   A2            20 88 00159         BISB2   #32, REG_ERR_FLAG+2             ; 0439
                                      0244   C2     02A4   C2 D1 0015D 24$:    CMPL    ACTUAL_REG+88, EXPECT_REG+88    ; 0441
                                                           05 13 00164         BEQL    25$                             ;
                                        06   A2       80   8F 88 00166         BISB2   #128, REG_ERR_FLAG+2            ; 0442
            50     0248  C2                  16            00 EF 0016B 25$:    EXTZV   #0, #22, EXPECT_REG+92, R0      ; 0444
            50     02A8  C2                  16            00 ED 00172         CMPZV   #0, #22, ACTUAL_REG+92, R0      ;
                                                           04 13 00179         BEQL    26$                             ;
                                        07   A2            01 88 0017B         BISB2   #1, REG_ERR_FLAG+3              ; 0445
            50     024B  C2                  01            07 EF 0017F 26$:    EXTZV   #7, #1, EXPECT_REG+95, R0       ; 0447
            50     02AB  C2                  01            07 ED 00186         CMPZV   #7, #1, ACTUAL_REG+95, R0       ;
```

```
                                                   04  13 0018D         BEQL    27$                                         ;
                              07    A2             04  88 0018F         BISB2   #4, REG_ERR_FLAG+3                          ; 0448
                                                       04 00193 27$:    RET                                                 ; 0310

; Routine Size:  404 bytes,     Routine Base:  CODE + 014E


;          0455
;          0456  ! Begin main set-up code
;          0457
;          0458  ! ++
;          0459  !        Test comments
;          0460  ! See ENKAXL.MAR for test comments.
;          0461  ! The subtests are independent of each other.
;          0462  !
;          0463  ! --
;          0464
;          0465  GLOBAL ROUTINE TEST_CONTROL =
;          0466      BEGIN
;          0467
;          0468      BUILTIN
;          0469          MFPR,                       ! Move from Process register
;          0470          MTPR;                       ! Move to Process register
;          0471
;          0472  ! Pattern set-up to initialize memory management registers before
;          0473  ! LDPCTX instruction ie. P0LR, P0LR, P1BR, P1LR
;          0474
;          0475      OWN
;          0476          INIT_MNGT:VECTOR[4] INITIAL(%X'8A5A5A58',
;          0477                                      %X'040A5A5A',
;          0478                                      %X'8A5A5A58',
;          0479                                      %X'000A5A5A');
;          0480      LOCAL
;          0481          STATUS,                     ! Returns status codes from DS calls
;          0482          DATA,                       ! Temporarily holds fill characters when
;          0483                                      ! defining REG_DATA
;          0484          ORIG_PCBB,                  ! Holds the Pcbb of the process context
;          0485                                      ! previous to the first subtest
;          0486          TEMP_LONGWORD;              ! Temporary longword storage
;          0487  ! BEGIN code
;          0488
;          0489      IF .DSA$V_USER THEN             ! Can only be run in stand-alone
;          0490          $DS_ABORT (ARG = PROGRAM);
;          0491
;          0492  !
;          0493  !  Memory Management off, so we may have our own Kernel stack ptr
;          0494  !  If mem mgt can not be shut off (operator requested it on) then
;          0495  !  we do not want to continue the test
;          0496  !
;          0497      STATUS = $DS_MMOFF;
;          0498      IF NOT .STATUS THEN
;          0499          BEGIN
;        P 0500          $DS_ERRHARD (MSGADR = $ASCIC('Unable to shut off memory management.'),
;        L 0501                      PRLINK = PRINT_ERR);
; %PRINT:        Test 11, Subtest 0, Error 1
;          0502          $DS_ABORT (ARG = PROGRAM);
;          0503          END;
```

```

!
! REG_DATA is used to initialize the registers or a Pcb to a valid data
! pattern. Don't fool around with the KSP, don't know where we would end up.

    REG_DATA [PTX$L_ESP] = 0;                    ! should not try to access
    REG_DATA [PTX$L_SSP] = 0;                    ! any other stack pointer
    REG_DATA [PTX$L_USP] = 0;                    ! except on Priv_instr aborts

!
!   Fill the registers with various values, the value in FP will not be
!   loaded into the registers.
!
    DATA = 0;                   ! Start R0 with all zeroes
    INCR I FROM 4 TO 17 DO      ! The longword offsets of gen regs in PCB
        BEGIN
        MAP
            REG_DATA : VECTOR;  ! Make longword offsets easier

        REG_DATA [.I] = .DATA;
        DATA = .DATA + %X'11111111'     ! Effectively, add hex 11 to the
                                        ! fill character for the next register
        END;


!
!   Leave the memory management registers at the current valid value.
!
    MFPR (PR$_P0BR, REG_DATA [PTX$L_P0BR]);        ! Get the current value of
                                                   ! P0 Base Register
    MFPR (PR$_P0LR, TEMP_LONGWORD);                ! Store P0 length register in
                                                   ! a longword
    REG_DATA [PTX$V_P0LR] = .TEMP_LONGWORD<0,22>;! Extract the field
                                                   ! containing the value and
                                                   ! put it in Reg_Data
    MFPR (PR$_ASTLVL,  TEMP_LONGWORD);  ! MFPR always wants a longword
    REG_DATA [PTX$V_ASTLVL] = .TEMP_LONGWORD<0,3>;!AST level

    MFPR (PR$_P1BR,  REG_DATA [PTX$L_P1BR]);
    MFPR (PR$_P1LR, TEMP_LONGWORD);
    REG_DATA [PTX$V_P1LR] = .TEMP_LONGWORD<0,22>;! P1 Base Register
    MFPR (PR$_PME, TEMP_LONGWORD);                 ! Don't want to screw up
                                                   ! anyone's performance
                                                   ! monitering, so keep it the
                                                   ! same
    REG_DATA [PTX$V_PME] = .TEMP_LONGWORD<0,1>;

  ! All done with defining Reg_Data
!
! INIT_PCB is used to initialize PCB variables that might be changed by the
! execution of an instruction. It contains a background of 'Z's which no
! instruction produces so it is easy to see if something was not loaded in
! correctly.  Init_Pcb becomes Init_Reg for the Ldpctx instructions.
!


    CH$FILL (%C'Z', PTX$K_LENGTH, INIT_PCB);

```

```
;
;       ! ++
;       !
;       ! CHECK_STACK determines if the interrupt and kernel stacks should be
;       ! monitered before and after instruction execution. CHECK_STACK is an
;       ! implicit parameter to the EXECUTE routine in ENKAXL
;       !       Check_stack = 0  K -> I  start on kernel stack and end up on interrupt
;       !                   = 1  I -> I  start on interrupt stack, end on interrupt
;       !                   = 2  K -> K  start on kernel stack, end on kernel
;       !                   = 3  I -> K  start on interrupt stack, end on kernel
;       !
;       ! --
;
;
;       !
;
;
;       !
;       !
;       ! Set up for LDPCTX subtests
;       ! The contents of Actual_pcb will be loaded into the registers upon execution
;       ! of the Ldpctx instruction
;       !
;           MFPR (PR$_PCBB, ORIG_PCBB);          ! Save the original PCB location
;           MTPR (%REF(ACTUAL_PCB), PR$_PCBB);
;
;       !
;       ! The registers should be initialized with background before each execution
;       ! of Ldpctx, so fill Init_Reg with 'Z's from Init_pcb
;       !
;       ! Make sure memory management longwords in the PCB get loaded with the right
;       ! initial pattern
;       !
;           CH$MOVE (32, INIT_MNGT, INIT_PCB + 80);
;           CH$MOVE (PTX$K_LENGTH, INIT_PCB, INIT_REG);
;       !
;       ! Use typical data to load registers
;       !
;       !     CH$MOVE (PTX$K_LENGTH, REG_DATA, INIT_PCB);
;
;       !+
;       ! SUBTEST DESCRIPTION:
;       !       Subtest 1
;       !       Out of bounds P0 Base Register, test reserved operand abort,
;       !       LDPCTX.
;       !
;       ! SUBTEST STEPS:
;       !
;       !       Initialize the variables, background in Init_Regs, and data in
;       !       Init_Pcb. The registers will be loaded with background data before
;       !       the LDPCTX execution.
;       !       Modify the P0 Base Register in Init_Pcb and Actual_Pcb so the value
;       !       is out of bounds (set last byte to 1).
;       !       Start on the interrupt stack with kernel mode privileges.
;       !       When the execution gets to load P0BR from Actual_Pcb to registers
;       !       it will check the validity of the longword.  In this case it is
;       !       invalid and DS is called to handle a reserved operand abort, DS
;   !         calls the exception handler in this module, which sets Actual_-
;   !         Except to Resv_Opr abort.  The flow of control returns to the
;   !         code that checks the stack for validity in Execute.  When Execute
;   !         finishes it returns a status code of one for success and zero if
;   !         it has found something wrong with the stack. The subtest code
;   !         calls Print_Err if any errors are encountered, the test is aborted
;   !         if Execute did not come back sucessfully.
;   !
;   ! ERRORS:
;   !
;   !         Did not switch to Kernel stack
;   !         Unexpected exception - If the implementation of the instruction
;   !                 used checks for the P0BR error, the wrong exception took
;   !                 priority.  If the check is not included the exception
;   !                 received would relate to the out of bounds P0BR value
;   !                 loaded into the registers.
;   !
;   ! DEBUG:
;   !
;   !         *** HELPFUL HINTS FOR TRACKING HARDWARE FAULTS ***
;   !
;   !-
;      $DS_BGNSUB
;   !
;   !   Out-of-bounds P0BR should get a reserved operand abort.
;   !
;         CHECK_STACK = 3;          ! Start on interrupt stack, end on kernel,
;                                   ! LDPCTX
;         MODE = 0;                 ! All the privileges you'll ever need
;         ACTUAL_EXCEPT = NONE;                     ! Clear exceptions
;         EXPECTED_EXCEPT = RESV_OPR;               ! Expect a resv_opr_abort
;   !
;   !     Use normal data pattern to load the registers
;   !
;         CH$MOVE (PTX$K_LENGTH, REG_DATA, INIT_PCB);
;         INIT_PCB [83,6,2,0] = 1;          !Make P0BR out-of-bounds
;   !
;   !     PCB should remain the same whether it is loaded into the registers or
;   !     not
;   !
;         CH$MOVE (PTX$K_LENGTH, INIT_PCB, EXPECT_PCB);
;         CH$MOVE (PTX$K_LENGTH, INIT_PCB, ACTUAL_PCB);    ! Init Actual_Pcb
;   !
;   !     Initialize Actual_Reg with background, Init_regs still all 'Z's
;   !
;         CH$MOVE (PTX$K_LENGTH, INIT_REG, ACTUAL_REG);
;   !
;   !     Registers should not get any data loaded in
;   !
;         CH$MOVE (PTX$K_LENGTH, INIT_REG, EXPECT_REG);
;
;         IF NOT EXECUTE () THEN
;             $DS_ABORT (ARG = PROGRAM);
;   !
;   !     Registers are in an unknown state, so no check
;   !
;         IF (.EXPECTED_EXCEPT NEQ .ACTUAL_EXCEPT) THEN
;         0675                  BEGIN
;       P 0676                  $DS_ERRHARD (MSGADR = FAIL_LD_M,
;       P 0677                               PRLINK = PRINT_ERR,
;       P 0678                               P1 = SUB_MSG_1,
;       P 0679                               P2 = .EXPECTED_EXCEPT,
;       L 0680                               P3 = .ACTUAL_EXCEPT);
; %PRINT:       Test 11, Subtest 1, Error 2
;         0681                  END;
;         0682          $DS_ENDSUB;
;         0683
;         0684      !+
;         0685      ! SUBTEST DESCRIPTION:
;         0686      !       Subtest 2
;         0687      !       Invalid P0 Base Register value, start on interrupt stack,
;         0688      !       rest of data valid. Test for reserved operand abort.
;         0689      !
;         0690      ! SUBTEST STEPS:
;         0691      !
;         0692      !       Initialize as in subtest 1, set Actual_Pcb P0BR bit 1 to 1,
;         0693      !       an invalid value, it must be zero if it is to be loaded into
;         0694      !       the registers.
;         0695      !       If the correct exception is not in Actual_Except, Print_Err is
;         0696      !       called.  The data is unknown at this point, some of it is
;         0697      !       probably already loaded, but we don't know how much, so no
;         0698      !       data check is made.
;         0699      !
;         0700      ! ERRORS:
;         0701      !
;         0702      !       Did not switch to kernel stack - should have ended up on kernel
;         0703      !               stack, even if resv_opr exception was received, see
;         0704      !               subtest 1.
;         0705      !       Unexpected exception - If the check is not made in the implementa-
;         0706      !               tion another exception may occur because of the bad value
;         0707      !               for P0BR in the registers.
;         0708      !
;         0709      !
;         0710      ! DEBUG:
;         0711      !
;         0712      !       *** HELPFUL HINTS FOR TRACKING HARDWARE FAULTS ***
;         0713      !
;         0714      !-
;         0715          $DS_BGNSUB
;         0716      !
;         0717      !     Out of bounds P0BR should get a reserved operand abort
;         0718      !
;         0719              CHECK_STACK = 3;          ! Start on interrupt, end up on kernel stack,
;         0720                                        ! LDPCTX
;         0721              MODE = 0;                 ! Kernel mode
;         0722              ACTUAL_EXCEPT = NONE;                     ! Clear exceptions
;         0723              EXPECTED_EXCEPT = RESV_OPR;               ! Expect a reserved operand abort
;         0724      !
;         0725      !       Use normal data, then corrupt P0BR
;         0726      !
;         0727              CH$MOVE (PTX$K_LENGTH, REG_DATA, INIT_PCB);
;         0728              (INIT_PCB [PTX$L_P0BR])<0,1> = 1;                 ! Make P0BR out-of-bounds
;         0729      !
;         0730      !       The Pcb should remain unchanged
;         0731  !
;         0732          CH$MOVE (PTX$K_LENGTH, INIT_PCB, EXPECT_PCB);
;         0733          CH$MOVE (PTX$K_LENGTH, INIT_PCB, ACTUAL_PCB);    ! Init Actual_Pcb
;         0734                                                           ! with corrupt P0BR
;         0735  !
;         0736  !       Initialize Actual_Reg with background from Init_reg
;         0737  !
;         0738          CH$MOVE (PTX$K_LENGTH, INIT_REG, ACTUAL_REG);
;         0739  !
;         0740  !       The registers should not complete loading in the data from Init_pcb
;         0741  !
;         0742          CH$MOVE (PTX$K_LENGTH, INIT_REG, EXPECT_REG);
;         0743
;         0744          IF NOT EXECUTE () THEN
;         0745              $DS_ABORT (ARG = PROGRAM);
;         0746
;         0747          IF (.EXPECTED_EXCEPT NEQ .ACTUAL_EXCEPT) THEN
;         0748              BEGIN
;       P 0749              $DS_ERRHARD (MSGADR = FAIL_LD_M,
;       P 0750                           PRLINK = PRINT_ERR,
;       P 0751                           P1 = SUB_MSG_2,
;       P 0752                           P2 = .EXPECTED_EXCEPT,
;       L 0753                           P3 = .ACTUAL_EXCEPT);
; %PRINT:       Test 11, Subtest 2, Error 3
;         0754              END;
;         0755      $DS_ENDSUB;
;         0756
;         0757  !+
;         0758  ! SUBTEST
;         0759  !       Subtest 3
;         0760  !       Test reserved operand abort, set MBZ two to all ones. Execute
;         0761  !       from the interrupt stack.
;         0762  !
;         0763  ! SUBTEST STEPS:
;         0764  !
;         0765  !       Initialize variables as in subtest 1, set Actual_Pcb [MBZ2] to
;         0766  !       negative one (all bits set), set Check_Stack to start on Interrupt
;         0767  !       stack. During execution DS should be called with a reserved oper-
;         0768  !       and abort, as in subtest 9. If the check is not made in the
;         0769  !       implementation tested another exception may occur before the break-
;         0770  !       point instruction which sends control to the exception handler after
;         0771  !       execution of the instruction is complete, this would result in an
;         0772  !       unexpected exception which may actually be valid. If control is
;         0773  !       not on the kernel stack when the Execute Check Results code is
;         0774  !       executed, Execute returns with a failure code, and the test is
;         0775  !       aborted.  If Actual_Except is not Resv_Opr_Abort, Print_Err is
;         0776  !       called.
;         0777  !
;         0778  ! ERRORS:
;         0779  !
;         0780  !       No exception - The implementation does not perform this check.
;         0781  !       Unexpected Exception - Wrong exception is getting priority.
;         0782  !       Did not Switch to Kernel stack - see subtest 1.
;         0783  !
;         0784  ! DEBUG:
;         0785  !
;         0786  !       *** HELPFUL HINTS FOR TRACKING HARDWARE FAULTS ***
;              !
;              !-
;                   $DS_BGNSUB
;              !
;              !     MBZ2 not equal to zero should get a reserved operand abort
;              !
;                       CHECK_STACK = 3;            ! Start on interrupt, end on kernel, LDPCTX
;                       MODE = 0;                   ! Kernel mode
;                       ACTUAL_EXCEPT = NONE;                       ! Clear exceptions
;                       EXPECTED_EXCEPT = RESV_OPR;                 ! Expect a resv_opr_abort
;              !
;              !        Load in typical data with corrupted MBZ2
;              !
;                       CH$MOVE (PTX$K_LENGTH, REG_DATA, INIT_PCB);
;                       INIT_PCB [PTX$V_MBZ2] = - 1;       ! Fill Must Be Zero field with ones
;              !
;              !        The Pcb should not be touched on a Ldpctx
;              !
;                       CH$MOVE (PTX$K_LENGTH, INIT_PCB, EXPECT_PCB);
;                       CH$MOVE (PTX$K_LENGTH, INIT_PCB, ACTUAL_PCB);     !Init Actual Pcb with
;                                                                         ! corrupt MBZ2 field
;              !
;              !        Initialize Actual_Reg with background 'Z's from Init_reg
;              !
;                       CH$MOVE (PTX$K_LENGTH, INIT_REG, ACTUAL_REG);
;              !
;              !        The registers should not load all of the data
;              !
;                       CH$MOVE (PTX$K_LENGTH, INIT_REG, EXPECT_REG);
;
;                       IF NOT EXECUTE () THEN
;                           $DS_ABORT (ARG = PROGRAM);
;              !
;              !        The contents of the regsters after Resv_opr_abort are unknown
;              !        so do not run Compare_pcb
;              !
;                       IF (.EXPECTED_EXCEPT NEQ .ACTUAL_EXCEPT) THEN
;                           BEGIN
;          P                $DS_ERRHARD (MSGADR = FAIL_LD_M,
;          P                             PRLINK = PRINT_ERR,
;          P                             P1 = SUB_MSG_3,
;          P                             P2 = .EXPECTED_EXCEPT,
;          L                             P3 = .ACTUAL_EXCEPT);
; %PRINT:      Test 11, Subtest 3, Error 4
;                           END;
;                   $DS_ENDSUB;
;
;              !+
;              ! SUBTEST DESCRIPTION:
;              !        Subtest 4
;              !        Reserved Operand Abort test, Astlevel reserved to Digital.
;              !        Execute off of kernel stack.
;              !
;              ! SUBTEST STEPS:
;              !
;              !        Initialize variables as in subtest 1, set Actual_Pcb [Astlevel]
;              !        to five, a value reserved to Digital. Set Check_Stack to start
;          0843  !       Execution from the Kernel stack. If the check is included in
;          0844  !       the implementation tested, a reserved operand abort should call
;          0845  !       DS as in subtest 1, when an attempt is made to load in an illegal
;          0846  !       value for Astlevel. If the check is not included, no exception
;          0847  !       should appear in Actual_Except. The data should not be checked
;          0848  !       as it is in an unknown state.
;          0849  !
;          0850  ! ERRORS:
;          0851  !
;          0852  !       Stray from kernel stack - stack corrupted
;          0853  !       No exception - reserved operand check not preformed for Astlevel
;          0854  !       Unexpected Exception - Wrong exception took precedence over
;          0855  !               reserved operand abort.
;          0856  !
;          0857  ! DEBUG:
;          0858  !
;          0859  !       *** HELPFUL HINTS FOR TRACKING HARDWARE FAULTS ***
;          0860  !
;          0861  !-
;          0862      $DS_BGNSUB
;          0863  !
;          0864  !    Reserved ASTLVL should get a reserved operand abort
;          0865  !
;          0866          CHECK_STACK = 2;          ! Start on kernel, end on kernel stack, LDPCTX
;          0867          MODE = 0;                 ! Kernel mode
;          0868          ACTUAL_EXCEPT = NONE;                        ! Clear exceptions
;          0869          EXPECTED_EXCEPT = RESV_OPR;                  ! Expect a resv_opr_abort
;          0870  !
;          0871          Use typical data with a corrupt Astlevel
;          0872  !
;          0873          CH$MOVE (PTX$K_LENGTH, REG_DATA, INIT_PCB);
;          0874          INIT_PCB [PTX$V_ASTLVL] = 5;      ! AST[VL reserved to Digital
;          0875  !
;          0876          PCB should not be altered
;          0877  !
;          0878          CH$MOVE (PTX$K_LENGTH, INIT_PCB, EXPECT_PCB);
;          0879          CH$MOVE (PTX$K_LENGTH, INIT_PCB, ACTUAL_PCB);    ! PCB to be loaded in
;          0880                                                           ! has an illegal
;          0881                                                           ! Astlevel
;          0882  !
;          0883          Fill Actual_Reg with background from Init_reg
;          0884  !
;          0885          CH$MOVE (PTX$K_LENGTH, INIT_REG, ACTUAL_REG);
;          0886  !
;          0887          Registers should not get all of INIT_pcb loaded in
;          0888  !
;          0889          CH$MOVE (PTX$K_LENGTH, INIT_REG, EXPECT_REG);
;          0890
;          0891          IF NOT EXECUTE () THEN
;          0892              $DS_ABORT (ARG = PROGRAM);
;          0893  !
;          0894          Do not compare unknown data received
;          0895  !
;          0896          IF (.EXPECTED_EXCEPT NEQ .ACTUAL_EXCEPT) THEN
;          0897              BEGIN
;        P 0898              $DS_ERRHARD (MSGADR = FAIL_LD_M,
;        P 0899                          PRLINK = PRINT_ERR,
;      P 0900                        P1 = SUB_MSG_4,
;      P 0901                        P2 = .EXPECTED_EXCEPT,
;      L 0902                        P3 = .ACTUAL_EXCEPT);
; %PRINT:        Test 11, Subtest 4, Error 5
;        0903                END;
;        0904       $DS_ENDSUB;
;        0905
;        0906    !+
;        0907    ! SUBTEST DESCRIPTION:
;        0908    !        Subtest 5
;        0909    !        Test for Reserved Operand Abort, P1 Base Register out of bounds,
;        0910    !        start execution of LDPCTX from the kernel stack.
;        0911    !
;        0912    ! SUBTEST STEPS:
;        0913    !
;        0914    !        Initialize as in subtest 5. Set P1 region Base Register field in
;        0915    !        Actual_Pcb to zero, set Check_Stack to start on the kernel stack.
;        0916    !        LDPCTX will load Actual_Pcb into the registers until it comes to
;        0917    !        the P1BR field, then a Reserved Operand Abort exception will occur
;        0918    !        and control will go to the exception handler in this module.
;        0919    !        Actual_Except will be set to Reserved Operand Abort.  Control goes
;        0920    !        to the
;        0921    !
;        0922    ! ERRORS:
;        0923    !
;        0924    !        Unexpected exception - exception other than Resv_Op cr Priv_Instr.
;        0925    !        Stray from Kernel stack - stack corrupted
;        0926    !        Wrong exception - Priv_Instr or no exception, Resv_Op expected
;        0927    !
;        0928    ! DEBUG:
;        0929    !
;        0930    !        *** HELPFUL HINTS FOR TRACKING HARDWARE FAULTS ***
;        0931    !
;        0932    !-
;        0933       $DS_BGNSUB
;        0934    !
;        0935      P1 Base Register out of bounds, should get a reserved operand abort
;        0936    !
;        0937           CHECK_STACK = 2;          ! Start on kernel, end on kernel stack, LDPCTX
;        0938           MODE = 0;                 ! Kernel mode
;        0939           ACTUAL_EXCEPT = NONE;                     ! Clear exceptions
;        0940           EXPECTED_EXCEPT = RESV_OPR;               ! Expect resv_opr_abort
;        0941    !
;        0942    !      Use with typical test pattern, and corrupt P1BR
;        0943    !
;        0944           CH$MOVE (PTX$K_LENGTH, REG_DATA, INIT_PCB);
;        0945           (INIT_PCB [PTX$L_P1BR])<30,2> = 1;        ! Invalid value in P1BR, keep bit one clear
;        0946    !
;        0947    !      LDPCTX does not alter Pcb it loads in
;        0948    !
;        0949           CH$MOVE (PTX$K_LENGTH, INIT_PCB, EXPECT_PCB);
;        0950           CH$MOVE (PTX$K_LENGTH, INIT_PCB, ACTUAL_PCB);        ! Init Pcb to be
;        0951                                                               ! loaded with bad P1BR
;        0952    !
;        0953    !      Initialize Actual_Reg with 'Z's from Init_reg
;        0954    !
;        0955           CH$MOVE (PTX$K_LENGTH, INIT_REG, ACTUAL_REG);
;         0956  !
;         0957  !           Resulting registers are unknown and may contain some data
;         0958  !
;         0959              CH$MOVE (PTX$K_LENGTH, INIT_REG, EXPECT_REG);
;         0960
;         0961              IF NOT EXECUTE () THEN
;         0962                  $DS_ABORT (ARG = PROGRAM);
;         0963  !
;         0964  !           Don't check unknown results, just want to make sure got the right
;         0965  !           exceptions
;         0966  !
;         0967              IF (.EXPECTED_EXCEPT NEQ .ACTUAL_EXCEPT) THEN
;         0968                  BEGIN
;       P 0969                  $DS_ERRHARD (MSGADR = FAIL_LD_M,
;       P 0970                               PRLINK = PRINT_ERR,
;       P 0971                               P1 = SUB_MSG_5,
;       P 0972                               P2 = .EXPECTED_EXCEPT,
;       L 0973                               P3 = .ACTUAL_EXCEPT);
; %PRINT:       Test 11, Subtest 5, Error 6
;         0974                  END;
;         0975          $DS_ENDSUB;
;         0976
;         0977  !+
;         0978  ! SUBTEST DESCRIPTION:
;         0979  !           Subtest 6
;         0980  !           Test Reserved Operand Abort, invalid P1BR - bit 0 set. Start on
;         0981  !           interrupt stack.
;         0982  !
;         0983  ! SUBTEST STEPS:
;         0984  !
;         0985  !           Initialize as in subtest 1, set Actual_Pcb [P1BR] bit 0 to one, this
;         0986  !           is a Must Be Zero field. The subtest will call Execute and LDPCTX
;         0987  !           will execute normally until it tries to load in the P1 Base Register
;         0988  !           value. A reserved operand abort will occur, the handler will catch the
;         0989  !           exception and record it in Actual_except. A check will be made to be
;         0990  !           sure the switch from interrupt to kernel stack was made correctly.
;         0991  !           Control returns to the subtest and a check is made on the exception
;         0992  !           received vs. the expected exception.
;         0993  !
;         0994  ! ERRORS:
;         0995  !
;         0996  !           Unexpected exception - LDPCTX got an exception other than reserved
;         0997  !                   operand abort or privileged instruction fault.
;         0998  !           Incorrect switch to the kernel stack- see subtest 1.
;         0999  !           Wrong exception - Got Privileged Instruction or no exception when
;         1000  !                   should have gotten Reserved Operand Abort.
;         1001  !
;         1002  ! DEBUG:
;         1003  !
;         1004  !           *** HELPFUL HINTS FOR TRACKING HARDWARE FAULTS ***
;         1005  !
;         1006  !-
;         1007          $DS_BGNSUB
;         1008  !
;         1009  !     P1 Base Register invalid, bit 0 set; Reserved operand abort
;         1010  !
;         1011              CHECK_STACK = 3;          ! Start on interrupt stack, end on kernel,
;        1012                            ! LDPCTX
;        1013        MODE = 0;           ! Kernel mode
;        1014        ACTUAL_EXCEPT = NONE;               ! Clear exceptions
;        1015        EXPECTED_EXCEPT = RESV_OPR;         ! Expect resv_opr_abort
;        1016   !
;        1017   !    Use normal test pattern with P1BR invalid
;        1018   !
;        1019        CH$MOVE (PTX$K_LENGTH, REG_DATA, INIT_PCB);
;        1020        (INIT_PCB [PTX$L_P1BR])<0,1> = 1 ;                 ! Set 0 bit
;        1021   !
;        1022   !    Ldpctx does not alter Pcb loaded
;        1023   !
;        1024        CH$MOVE (PTX$K_LENGTH, INIT_PCB, EXPECT_PCB);
;        1025        CH$MOVE (PTX$K_LENGTH, INIT_PCB, ACTUAL_PCB);      ! Init Pcb to be
;        1026                                                           ! loaded with invalid
;        1027                                                           ! P1BR
;        1028   !
;        1029   !    Initialize Actual_Reg with background from Init_reg
;        1030   !
;        1031        CH$MOVE (PTX$K_LENGTH, INIT_REG, ACTUAL_REG);
;        1032   !
;        1033   !    The registers resulting from Ldpctx execution are unknown and may or
;        1034   !    may not contain data
;        1035   !
;        1036        CH$MOVE (PTX$K_LENGTH, INIT_REG, EXPECT_REG);
;        1037
;        1038        IF NOT EXECUTE () THEN
;        1039            $DS_ABORT (ARG = PROGRAM);
;        1040   !
;        1041   !    Do not check unknown results
;        1042   !
;        1043        IF (.EXPECTED_EXCEPT NEQ .ACTUAL_EXCEPT) THEN
;        1044            BEGIN
;      P 1045            $DS_ERRHARD (MSGADR = FAIL_LD_M,
;      P 1046                         PRLINK = PRINT_ERR,
;      P 1047                         P1 = SUB_MSG_6,
;      P 1048                         P2 = .EXPECTED_EXCEPT,
;      L 1049                         P3 = .ACTUAL_EXCEPT);
; %PRINT:       Test 11, Subtest 6, Error 7
;        1050            END;
;        1051        $DS_ENDSUB;
;        1052
;        1053        MTPR (ORIG_PCBB, PR$_PCBB); ! Restore original PCB
;        1054        SS$_NORMAL
;        1055        END;                ! To the Initial Exception handler, goes to



                                                                .PSECT  $PLIT$,NOWRT,NOEXE,2

74  75  68  73  20  6F  74  20  65  6C  62  61  6E  55  25  002C6 P.AAV:  .ASCII  \%Unable to shut off memory management.\   ;
6E  61  6D  20  79  72  6F  6D  65  6D  20  66  66  6F  20  002D5                                                                ;
                            2E  74  6E  65  6D  65  67  61  002E4                                                                ;

                                                                .PSECT  $OWN$,NOEXE,2

          000A5A5A  8A5A5A58  040A5A5A  8A5A5A58  00000 INIT_MNGT:
```

```
                                                                        .LONG   -1973790120, 67787354, -1973790120, 678490  ;

                                                                        .EXTRN  DS$ABORT, DS$MMOFF
                                                                        .EXTRN  DS$ERRHARD, DS$BGNSUB
                                                                        .EXTRN  DS$ENDSUB

                                                                        .PSECT  CODE,NOWRT,2

                                                  0FFC     00000        .ENTRY  TEST_CONTROL, Save R2,R3,R4,R5,R6,R7,R8,R9,-; 0465
                                                                                R10,R11                                     ;
                                      5B 00000000G  9F  9E 00002        MOVAB   @#DS$BGNSUB, R11                            ;
                                      5A 00000000G  9F  9E 00009        MOVAB   @#DS$ERRHARD, R10                           ;
                                      59 00000000G  9F  9E 00010        MOVAB   @#DS$ABORT, R9                              ;
                                      58     0000'  CF  9E 00017        MOVAB   NONE, R8                                    ;
                                      57     0000'  CF  9E 0001C        MOVAB   INIT_PCB, R7                                ;
                        03 0000FE03   9F            04  E1 00021        BBC     #4, @#^X0000FE03, 1$                        ; 0489
                                      69            00  FB 00029        CALLS   #0, DS$ABORT                                ; 0490
                           00000000G  9F            00  FB 0002C 1$:    CALLS   #0, @#DS$MMOFF                              ; 0497
                                      17            50  E8 00033        BLBS    STATUS, 2$                                  ; 0498
                                                    7E  7C 00036        CLRQ    -(SP)                                       ; 0501
                                                    7E  7C 00038        CLRQ    -(SP)                                       ;
                                                    7E  7C 0003A        CLRQ    -(SP)                                       ;
                                             FCDE   CF  9F 0003C        PUSHAB  PRINT_ERR                                   ;
                                             02C6   C8  9F 00040        PUSHAB  P.AAV                                       ;
                                      7E            01  7D 00044        MOVQ    #1, -(SP)                                   ;
                                      6A            0A  FB 00047        CALLS   #10, DS$ERRHARD                             ;
                                      69            00  FB 0004A        CALLS   #0, DS$ABORT                                ; 0502
                                               A4   A7  7C 0004D 2$:    CLRQ    REG_DATA+4                                  ; 0509
                                               AC   A7  D4 00050        CLRL    REG_DATA+12                                 ; 0511
                                      50            04  7D 00053        MOVQ    #4, I                                       ; 0518
                                 A0 A740            81  7E 00056 3$:    MOVAQ   (DATA)+, REG_DATA[I]                        ; 0523
                                      51 11111109   E1  9E 0005B        MOVAB   286331145(R1), DATA                         ; 0524
                        F0            50            11  F3 00062        AOBLEQ  #17, I, 3$                                  ; 0518
                                 F0   A7            08  DB 00066        MFPR    #8, REG_DATA+80                             ; 0532
                                      50            09  DB 0006A        MFPR    #9, TEMP_LONGWORD                           ; 0534
     F4   A7            16            00            50  F0 0006D        INSV    TEMP_LONGWORD, #0, #22, REG_DATA+84         ; 0536
                                      50            13  DB 00073        MFPR    #19, TEMP_LONGWORD                          ; 0539
     F7   A7            03            00            50  F0 00076        INSV    TEMP_LONGWORD, #0, #3, REG_DATA+87          ; 0540
                                 F8   A7            0A  DB 0007C        MFPR    #10, REG_DATA+88                            ; 0542
                                      50            0B  DB 00080        MFPR    #11, TEMP_LONGWORD                          ; 0543
     FC   A7            16            00            50  F0 00083        INSV    TEMP_LONGWORD, #0, #22, REG_DATA+92         ; 0544
                                      50            3D  DB 00089        MFPR    #61, TEMP_LONGWORD                          ; 0545
     FF   A7            01            07            50  F0 0008C        INSV    TEMP_LONGWORD, #7, #1, REG_DATA+95          ; 0549
   0060   8F       5A   8F            6E            00  2C 00092        MOVC5   #0, (SP), #90, #96, INIT_PCB                ; 0559
                                                    67     0009A                                                            ;
                                      56            10  DB 0009B        MFPR    #16, ORIG_PCBB                              ; 0584
                                      50     00C0   C7  9E 0009E        MOVAB   ACTUAL_PCB, R0                              ; 0585
                                      10            50  DA 000A3        MTPR    R0, #16                                     ;
                  50   A7     0000'  CF            20  28 000A6        MOVC3   #32, INIT_MNGT, INIT_PCB+80                 ; 0594
                0120   C7            67     0060   8F  28 000AD        MOVC3   #96, INIT_PCB, INIT_REG                     ; 0595
                                                    01  DD 000B5        PUSHL   #1                                          ;
                                                    0B  DD 000B7        PUSHL   #11                                         ;
                                      6B            02  FB 000B9        CALLS   #2, DS$BGNSUB                               ;
                                 90   A7            03  B0 000BC        MOVW    #3, CHECK_STACK                             ; 0644
                                 88   A7            68  9E 000C0        MOVAB   NONE, ACTUAL_EXCEPT                         ; 0595
                                 8C   A7       06   A8  9E 000C4        MOVAB   RESV_OPR, EXPECTED_EXCEPT                   ;
                        67       A0   A7     0060   8F  28 000C9        MOVC3   #96, REG_DATA, INIT_PCB                     ; 0652
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    53  A7            02              06              01  F0 000D0          INSV    #1, #6, #2, INIT_PCB+83                     ; 0653
           60   A7                    67      0060    8F  28 000D6          MOVC3   #96, INIT_PCB, EXPECT_PCB                   ; 0658
         00C0   C7                    67      0060    8F  28 000DD          MOVC3   #96, INIT_PCB, ACTUAL_PCB                   ; 0659
         01E0   C7          0120      C7      0060    8F  28 000E5          MOVC3   #96, INIT_REG, ACTUAL_REG                   ; 0663
         0180   C7          0120      C7      0060    8F  28 000EF          MOVC3   #96, INIT_REG, EXPECT_REG                   ; 0667
                                         00000000G    EF  16 000F9          JSB     EXECUTE                                     ; 0669
                                      03              50  E8 000FF          BLBS    R0, 4$                                      ;
                                      69              00  FB 00102          CALLS   #0, DS$ABORT                                ; 0670
                            88        A7        8C    A7  D1 00105 4$:      CMPL    EXPECTED_EXCEPT, ACTUAL_EXCEPT              ; 0674
                                                      1A  13 0010A          BEQL    5$                                          ;
                                                      7E  7C 0010C          CLRQ    -(SP)                                       ; 0680
                                                      7E  D4 0010E          CLRL    -(SP)                                       ;
                                                88    A7  DD 00110          PUSHL   ACTUAL_EXCEPT                               ;
                                                8C    A7  DD 00113          PUSHL   EXPECTED_EXCEPT                             ;
                                                2E    A8  9F 00116          PUSHAB  SUB_MSG_1                                   ;
                                              FC01    CF  9F 00119          PUSHAB  PRINT_ERR                                   ;
                                                1E    A8  9F 0011D          PUSHAB  FAIL_LD_M                                   ;
                                      7E              02  7D 00120          MOVQ    #2, -(SP)                                   ;
                                      6A              0A  FB 00123          CALLS   #10, DS$ERRHARD                             ;
                                                      01  DD 00126 5$:      PUSHL   #1                                          ; 0681
                                                      0B  DD 00128          PUSHL   #11                                         ;
                         00000000G    9F              02  FB 0012A          CALLS   #2, @#DS$ENDSUB                             ;
                                                      02  DD 00131          PUSHL   #2                                          ; 0682
                                                      0B  DD 00133          PUSHL   #11                                         ;
                                      6B              02  FB 00135          CALLS   #2, DS$BGNSUB                               ;
                            90        A7              03  B0 00138          MOVW    #3, CHECK_STACK                             ; 0719
                            88        A7              68  9E 0013C          MOVAB   NONE, ACTUAL_EXCEPT                         ; 0682
                            8C        A7        06    A8  9E 00140          MOVAB   RESV_OPR, EXPECTED_EXCEPT                   ;
                67          A0        A7      0060    8F  28 00145          MOVC3   #96, REG_DATA, INIT_PCB                     ; 0727
                            50        A7              01  88 0014C          BISB2   #1, INIT_PCB+80                             ; 0728
           60   A7                    67      0060    8F  28 00150          MOVC3   #96, INIT_PCB, EXPECT_PCB                   ; 0732
         00C0   C7                    67      0060    8F  28 00157          MOVC3   #96, INIT_PCB, ACTUAL_PCB                   ; 0733
         01E0   C7          0120      C7      0060    8F  28 0015F          MOVC3   #96, INIT_REG, ACTUAL_REG                   ; 0738
         0180   C7          0120      C7      0060    8F  28 00169          MOVC3   #96, INIT_REG, EXPECT_REG                   ; 0742
                                         00000000G    EF  16 00173          JSB     EXECUTE                                     ; 0744
                                      03              50  E8 00179          BLBS    R0, 6$                                      ;
                                      69              00  FB 0017C          CALLS   #0, DS$ABORT                                ; 0745
                            88        A7        8C    A7  D1 0017F 6$:      CMPL    EXPECTED_EXCEPT, ACTUAL_EXCEPT              ; 0747
                                                      1A  13 00184          BEQL    7$                                          ;
                                                      7E  7C 00186          CLRQ    -(SP)                                       ; 0753
                                                      7E  D4 00188          CLRL    -(SP)                                       ;
                                                88    A7  DD 0018A          PUSHL   ACTUAL_EXCEPT                               ;
                                                8C    A7  DD 0018D          PUSHL   EXPECTED_EXCEPT                             ;
                                                57    A8  9F 00190          PUSHAB  SUB_MSG_2                                   ;
                                              FB87    CF  9F 00193          PUSHAB  PRINT_ERR                                   ;
                                                1E    A8  9F 00197          PUSHAB  FAIL_LD_M                                   ;
                                      7E              03  7D 0019A          MOVQ    #3, -(SP)                                   ;
                                      6A              0A  FB 0019D          CALLS   #10, DS$ERRHARD                             ;
                                                      02  DD 001A0 7$:      PUSHL   #2                                          ; 0754
                                                      0B  DD 001A2          PUSHL   #11                                         ;
                         00000000G    9F              02  FB 001A4          CALLS   #2, @#DS$ENDSUB                             ;
                                                      03  DD 001AB          PUSHL   #3                                          ; 0755
                                                      0B  DD 001AD          PUSHL   #11                                         ;
                                      6B              02  FB 001AF          CALLS   #2, DS$BGNSUB                               ;
                            90        A7              03  B0 001B2          MOVW    #3, CHECK_STACK                             ; 0793
                            88        A7              68  9E 001B6          MOVAB   NONE, ACTUAL_EXCEPT                         ; 0755
                            8C        A7        06    A8  9E 001BA          MOVAB   RESV_OPR, EXPECTED_EXCEPT                   ;
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                   67       A0  A7      0060   8F 28 001BF          MOVC3   #96, REG_DATA, INIT_PCB                         ; 0800
                            57  A7        F8   8F 88 001C6          BISB2   #248, INIT_PCB+87                               ; 0801
               60  A7           67      0060   8F 28 001CB          MOVC3   #96, INIT_PCB, EXPECT_PCB                       ; 0805
             00C0  C7           67      0060   8F 28 001D2          MOVC3   #96, INIT_PCB, ACTUAL_PCB                       ; 0806
             01E0  C7     0120  C7      0060   8F 28 001DA          MOVC3   #96, INIT_REG, ACTUAL_REG                       ; 0811
             0180  C7     0120  C7      0060   8F 28 001E4          MOVC3   #96, INIT_REG, EXPECT_REG                       ; 0815
                                   00000000G   EF 16 001EE          JSB     EXECUTE                                         ; 0817
                                03             50 E8 001F4          BLBS    R0, 8$                                          ;
                                69             00 FB 001F7          CALLS   #0, DS$ABORT                                    ; 0818
                            88  A7        8C   A7 D1 001FA  8$:     CMPL    EXPECTED_EXCEPT, ACTUAL_EXCEPT                  ; 0823
                                               1A 13 001FF          BEQL    9$                                              ;
                                               7E 7C 00201          CLRQ    -(SP)                                           ; 0829
                                               7E D4 00203          CLRL    -(SP)                                           ;
                                          88   A7 DD 00205          PUSHL   ACTUAL_EXCEPT                                   ;
                                          8C   A7 DD 00208          PUSHL   EXPECTED_EXCEPT                                 ;
                                          7F   A8 9F 0020B          PUSHAB  SUB_MSG_3                                       ;
                                        FB0C   CF 9F 0020E          PUSHAB  PRINT_ERR                                       ;
                                          1E   A8 9F 00212          PUSHAB  FAIL_LD_M                                       ;
                                7E             04 7D 00215          MOVQ    #4, -(SP)                                       ;
                                6A             0A FB 00218          CALLS   #10, DS$ERRHARD                                 ;
                                               03 DD 0021B  9$:     PUSHL   #3                                              ; 0830
                                               0B DD 0021D          PUSHL   #11                                             ;
                     00000000G  9F             02 FB 0021F          CALLS   #2, @#DS$ENDSUB                                 ;
                                               04 DD 00226          PUSHL   #4                                              ; 0831
                                               0B DD 00228          PUSHL   #11                                             ;
                                6B             02 FB 0022A          CALLS   #2, DS$BGNSUB                                   ;
                            90  A7             02 B0 0022D          MOVW    #2, CHECK_STACK                                 ; 0866
                            88  A7             68 9E 00231          MOVAB   NONE, ACTUAL_EXCEPT                             ; 0831
                            8C  A7        06   A8 9E 00235          MOVAB   RESV_OPR, EXPECTED_EXCEPT                       ;
                   67       A0  A7      0060   8F 28 0023A          MOVC3   #96, REG_DATA, INIT_PCB                         ; 0873
    57   A7        03           00             05 F0 00241          INSV    #5, #0, #3, INIT_PCB+87                         ; 0874
               60  A7           67      0060   8F 28 00247          MOVC3   #96, INIT_PCB, EXPECT_PCB                       ; 0878
             00C0  C7           67      0060   8F 28 0024E          MOVC3   #96, INIT_PCB, ACTUAL_PCB                       ; 0879
             01E0  C7     0120  C7      0060   8F 28 00256          MOVC3   #96, INIT_REG, ACTUAL_REG                       ; 0885
             0180  C7     0120  C7      0060   8F 28 00260          MOVC3   #96, INIT_REG, EXPECT_REG                       ; 0889
                                   00000000G   EF 16 0026A          JSB     EXECUTE                                         ; 0891
                                03             50 E8 00270          BLBS    R0, 10$                                         ;
                                69             00 FB 00273          CALLS   #0, DS$ABORT                                    ; 0892
                            88  A7        8C   A7 D1 00276  10$:    CMPL    EXPECTED_EXCEPT, ACTUAL_EXCEPT                  ; 0896
                                               1B 13 0027B          BEQL    11$                                             ;
                                               7E 7C 0027D          CLRQ    -(SP)                                           ; 0902
                                               7E D4 0027F          CLRL    -(SP)                                           ;
                                          88   A7 DD 00281          PUSHL   ACTUAL_EXCEPT                                   ;
                                          8C   A7 DD 00284          PUSHL   EXPECTED_EXCEPT                                 ;
                                        00A7   C8 9F 00287          PUSHAB  SUB_MSG_4                                       ;
                                        FA8F   CF 9F 0028B          PUSHAB  PRINT_ERR                                       ;
                                          1E   A8 9F 0028F          PUSHAB  FAIL_LD_M                                       ;
                                7E             05 7D 00292          MOVQ    #5, -(SP)                                       ;
                                6A             0A FB 00295          CALLS   #10, DS$ERRHARD                                 ;
                                               04 DD 00298  11$:    PUSHL   #4                                              ; 0903
                                               0B DD 0029A          PUSHL   #11                                             ;
                     00000000G  9F             02 FB 0029C          CALLS   #2, @#DS$ENDSUB                                 ;
                                               05 DD 002A3          PUSHL   #5                                              ; 0904
                                               0B DD 002A5          PUSHL   #11                                             ;
                                6B             02 FB 002A7          CALLS   #2, DS$BGNSUB                                   ;
                            90  A7             02 B0 002AA          MOVW    #2, CHECK_STACK                                 ; 0937
                            88  A7             68 9E 002AE          MOVAB   NONE, ACTUAL_EXCEPT                             ; 0904
```

```
                                    8C   A7          06  A8  9E 002B2        MOVAB   RESV_OPR, EXPECTED_EXCEPT             ;
                        67          A0   A7        0060  8F  28 002B7        MOVC3   #96, REG_DATA, INIT_PCB               ; 0944
    5B   A7             02               06              01  F0 002BE        INSV    #1, #6, #2, INIT_PCB+91               ; 0945
                60      A7               67        0060  8F  28 002C4        MOVC3   #96, INIT_PCB, EXPECT_PCB             ; 0949
              00C0      C7               67        0060  8F  28 002CB        MOVC3   #96, INIT_PCB, ACTUAL_PCB             ; 0950
              01E0      C7        0120   C7        0060  8F  28 002D3        MOVC3   #96, INIT_REG, ACTUAL_REG             ; 0955
              0180      C7        0120   C7        0060  8F  28 002DD        MOVC3   #96, INIT_REG, EXPECT_REG             ; 0959
                                              00000000G  EF  16 002E7        JSB     EXECUTE                               ; 0961
                                         03              50  E8 002ED        BLBS    R0, 12$                               ;
                                         69              00  FB 002F0        CALLS   #0, DS$ABORT                          ; 0962
                                    88   A7          8C  A7  D1 002F3 12$:   CMPL    EXPECTED_EXCEPT, ACTUAL_EXCEPT        ; 0967
                                                         1B  13 002F8        BEQL    13$                                   ;
                                                         7E  7C 002FA        CLRQ    -(SP)                                 ; 0973
                                                         7E  D4 002FC        CLRL    -(SP)                                 ;
                                                     88  A7  DD 002FE        PUSHL   ACTUAL_EXCEPT                         ;
                                                     8C  A7  DD 00301        PUSHL   EXPECTED_EXCEPT                       ;
                                                   00CA  C8  9F 00304        PUSHAB  SUB_MSG_5                             ;
                                                   FA12  CF  9F 00308        PUSHAB  PRINT_ERR                             ;
                                                     1E  A8  9F 0030C        PUSHAB  FAIL_LD_M                             ;
                                         7E              06  7D 0030F        MOVQ    #6, -(SP)                             ;
                                         6A              0A  FB 00312        CALLS   #10, DS$ERRHARD                       ;
                                                         05  DD 00315 13$:   PUSHL   #5                                    ; 0974
                                                         0B  DD 00317        PUSHL   #11                                   ;
                             00000000G   9F              02  FB 00319        CALLS   #2, @#DS$ENDSUB                       ;
                                                         06  DD 00320        PUSHL   #6                                    ; 0975
                                                         0B  DD 00322        PUSHL   #11                                   ;
                                         6B              02  FB 00324        CALLS   #2, DS$BGNSUB                         ;
                                    90   A7              03  B0 00327        MOVW    #3, CHECK_STACK                       ; 1011
                                    88   A7              68  9E 0032B        MOVAB   NONE, ACTUAL_EXCEPT                   ; 0975
                                    8C   A7          06  A8  9E 0032F        MOVAB   RESV_OPR, EXPECTED_EXCEPT             ;
                        67          A0   A7        0060  8F  28 00334        MOVC3   #96, REG_DATA, INIT_PCB               ; 1019
                                    58   A7              01  88 0033B        BISB2   #1, INIT_PCB+88                       ; 1020
                60      A7               67        0060  8F  28 0033F        MOVC3   #96, INIT_PCB, EXPECT_PCB             ; 1024
              00C0      C7               67        0060  8F  28 00346        MOVC3   #96, INIT_PCB, ACTUAL_PCB             ; 1025
              01E0      C7        0120   C7        0060  8F  28 0034E        MOVC3   #96, INIT_REG, ACTUAL_REG             ; 1031
              0180      C7        0120   C7        0060  8F  28 00358        MOVC3   #96, INIT_REG, EXPECT_REG             ; 1036
                                              00000000G  EF  16 00362        JSB     EXECUTE                               ; 1038
                                         03              50  E8 00368        BLBS    R0, 14$                               ;
                                         69              00  FB 0036B        CALLS   #0, DS$ABORT                          ; 1039
                                    88   A7          8C  A7  D1 0036E 14$:   CMPL    EXPECTED_EXCEPT, ACTUAL_EXCEPT        ; 1043
                                                         1B  13 00373        BEQL    15$                                   ;
                                                         7E  7C 00375        CLRQ    -(SP)                                 ; 1049
                                                         7E  D4 00377        CLRL    -(SP)                                 ;
                                                     88  A7  DD 00379        PUSHL   ACTUAL_EXCEPT                         ;
                                                     8C  A7  DD 0037C        PUSHL   EXPECTED_EXCEPT                       ;
                                                   00F0  C8  9F 0037F        PUSHAB  SUB_MSG_6                             ;
                                                   F997  CF  9F 00383        PUSHAB  PRINT_ERR                             ;
                                                     1E  A8  9F 00387        PUSHAB  FAIL_LD_M                             ;
                                         7E              07  7D 0038A        MOVQ    #7, -(SP)                             ;
                                         6A              0A  FB 0038D        CALLS   #10, DS$ERRHARD                       ;
                                                         06  DD 00390 15$:   PUSHL   #6                                    ; 1050
                                                         0B  DD 00392        PUSHL   #11                                   ;
                             00000000G   9F              02  FB 00394        CALLS   #2, @#DS$ENDSUB                       ;
                                         10              56  DA 0039B        MTPR    ORIG_PCBB, #16                        ; 1053
                                         50              01  D0 0039E        MOVL    #1, R0                                ; 0465
                                                             04 003A1        RET                                           ;
```

```
; Routine Size:  930 bytes,    Routine Base:  CODE + 02E2


;        1056                                      ! $DS_ENDTEST
;        1057  $DS_ENDMOD;
;        1058  END
;        1059  ELUDOM



                                                              .PSECT  $TSTCNT,NOWRT,NOEXE,  OVR,2

                                           0000000B  00000 L_TSTCNT:
                                                              .LONG   11                                    ;



;                                  PSECT SUMMARY
;
;       Name                     Bytes                        Attributes
;
;   $PLIT$                         748  NOVEC,NOWRT,  RD ,NOEXE,NOSHR,  LCL,  REL,  CON,NOPIC,ALIGN(2)
;   GLOBALS                        704  NOVEC,  WRT,  RD ,NOEXE,NOSHR,  LCL,  REL,  CON,NOPIC,ALIGN(2)
;   CODE                          1668  NOVEC,NOWRT,  RD ,  EXE,NOSHR,  LCL,  REL,  CON,NOPIC,ALIGN(2)
;   $OWN$                           16  NOVEC,  WRT,  RD ,NOEXE,NOSHR,  LCL,  REL,  CON,NOPIC,ALIGN(2)
;   $TSTCNT                          4  NOVEC,NOWRT,  RD ,NOEXE,NOSHR,  LCL,  REL,  OVR,NOPIC,ALIGN(2)




;                             LIBRARY STATISTICS
;
;                                         -------- Symbols --------       Blocks
;       File                              Total     Loaded   Percent        Read
;
;   SYS$SYSROOT:[SYSLIB]LIB.L32;4         11296        13          0         414
;   SYS$SYSROOT:[SYSLIB]DIAG.L32;234        761        15          1          46




;                                  COMMAND QUALIFIERS

;       BLISS /LIS ENKAXK

; Size:          1668 code + 1472 data bytes
; Run Time:         00:28.4
; Elapsed Time:     00:51.9
; Memory Used:   669 pages
; Compilation Complete
```

Table of contents

```
     (2)       62        DECLARATIONS
     (2)      211        <Subroutines>
     (2)      324        TEST 11:  Load Process Context
```

```
0000
0000    .TITLE ENKAXL Ldpctx Execute
0000    .IDENT  /1-3/
0000    .LIST   MEB
0000    .NLIST  CND
0000    .DEFAULT DISPLACEMENT, LONG     ;***  CHANGE THIS TO LONG FOR DEBUG ***
0000
0000    ;++
0000    ; COPYRIGHT (C) 1982
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0000    ;
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0000    ; SOFTWARE ON EQUIPMENT WHICH IS NOT SUPPLIED BY DEC.
0000    ;++
0000
0000    ;++
0000    ; FACILITY:     VAX DIAGNOSTIC.
0000    ;
0000    ; ABSTRACT:
0000    ; The Load Process Context (LDPCTX) instruction test is part of the
0000    ; Privileged Instuction Set , which tests the valadity of data being
0000    ; loaded into the Process Control Block during a LDPCTX operation,
0000    ; according to its definition in the System Reference Manual.
0000    ;
0000    ;
0000    ; ENVIRONMENT:  VAX DIAGNOSTIC SUPERVISOR.
0000    ;
0000    ; AUTHOR:       Kevin Martin              9-NOV-1982      Version 1
0000    ;
0000    ;
0000    ; MODIFIED BY:
0000    ;
0000    ;               Tai-Chun Pan    01-Apr-83       Version 1.2
0000    ;
0000    ;               Added quick flag on Test 7(TU58). If quick flag is set
0000    ;               will skip subtest 4 through subtest 11.  Added event flag 3.
0000    ;               If event flag 3 is set, will override protection,
0000    ;               i.e., go ahead and write on tape.  If run APT & event flag 3
0000    ;               is clear & tape is not scratch, will report an error.
0000    ;               Modified Unibus sizer on Test 8 & 9. make test run faster.
0000    ;
0000    ;
0000    ;               Tai-Chun Pan    03-Aug-83       Version 1.3
0000    ;
0000    ;               fixed bugs on TEST 7 and error summary routine call when
```

```
                        0000    58 ;              running under APT.
                        0000    59 ;
                        0000    60 ;--
```

```
0000                  .SBTTL  DECLARATIONS
0000
0000    .LIBRARY              \SYS$LIBRARY:LIB\
0000    .LIBRARY              \SYS$LIBRARY:DIAG\        ; Vax Family Diagnostic Library
0000    .LIBRARY              \ENKAX\                   ; Library used by Enkax modules
0000
0000    ;+
0000    ; MACROS:
0000    ;-
0000                  $DS_DSADEF
0000                  $DS_SCBDEF
0000                  $PRDEF
0000                  $PSLDEF
0000                  ENKAX_SECDEF
0000    ;
0000    ; User defined macros
0000    ;
0000
0000                  $DEFINI     PTX
0000                          $DEF      PTX$L_KSP, .BLKL, 1
0004                          $DEF      PTX$L_ESP, .BLKL,1
0008                          $DEF      PTX$L_SSP, .BLKL,1
000C                          $DEF      PTX$L_USP, .BLKL,1
0010                          $DEF      PTX$L_R0, .BLKL, 1
0014                          $DEF      PTX$L_R1, .BLKL, 1
0018                          $DEF      PTX$L_R2, .BLKL, 1
001C                          $DEF      PTX$L_R3, .BLKL, 1
0020                          $DEF      PTX$L_R4, .BLKL, 1
0024                          $DEF      PTX$L_R5, .BLKL, 1
0028                          $DEF      PTX$L_R6, .BLKL, 1
002C                          $DEF      PTX$L_R7, .BLKL, 1
0030                          $DEF      PTX$L_R8, .BLKL, 1
0034                          $DEF      PTX$L_R9, .BLKL, 1
0038                          $DEF      PTX$L_R10, .BLKL,1
003C                          $DEF      PTX$L_R11, .BLKL,1
0040                          $DEF      PTX$L_AP, .BLKL, 1
0044                          $DEF      PTX$L_FP, .BLKL, 1
0048                          $DEF      PTX$L_PC, .BLKL, 1
004C                          $DEF      PTX$L_PSL, .BLKL,1
0050                          $DEF      PTX$L_P0BR, .BLKL,1
0054                          $DEF      PTX$L_P0LRASTL, .BLKL,1
0058                          $VIELD    PTX,0, <-
0058                                    <P0LR, 22>-
0058                                    <MBZ1,2>-
0058                                    <ASTLVL,3>-
0058                                    <MBZ2,5>>
0058                          $DEF      PTX$L_P1BR, .BLKL,1
005C                          $DEF      PTX$L_P1LRPME, .BLKL,1
0060                          $VIELD    PTX,0, <-
0060                                    <P1LR,22>-
0060                                    <MBZ3,9>-
0060                                    <PME,1>>
0060                          $DEF      PTX$K_SIZE
0060                          $DEFEND PTX
0000
0000    ;
0000    ; Macros
```

```
                    0000   ;
                    0000   .MACRO  SAVE_R  PCB              ; Routine to call Save_regs with param PCB
                    0000           PUSHAB  PCB              ; Put PCB address on stack, don't
                    0000                                    ; disturb regs
                    0000           JSB     SAVE_REGS        ; Do the Save_regs routine
                    0000           ADDL2   #4, SP           ; Pop PCB address off the stack
                    0000   .ENDM   SAVE_R
                    0000
                    0000   ;
                    0000   ;
                    0000   ;
                    0000
                    0000   .MACRO  PUSH_R  PCB              ; Routine to call Push_regs with param PCB
                    0000           PUSHAB  PCB              ; Put PCB address on stack as parameter
                    0000           JSB     PUSH_REGS        ; Do Push_regs routine
                    0000           ADDL2   #4, SP           ; Clean off stack
                    0000   .ENDM   PUSH_R
                    0000
                    0000   ;
                    0000   ; Declarations
                    0000   ;
                    0000
                    0000   $DS_BGNMOD      ENV= CEP_REPAIR, TN = 11
                    0000   ;;;     Macro-32 Diagnostic macro library Version 6.10 'DIAG.MLB (137)'
                    0000
                    0000   ;+
                    0000   ; PROGRAMMER DEFINED LOCAL AND GLOBAL STORAGE
                    0000   ;-
                    0000   ;
                    0000   ;******************************************************************************
                    0000   ;
                    0000   ; EXTERNAL
                    0000   ;
                    0000   ; All from ENKAXK
                    0000   ;
                    0000   ;   HANDLER : WORD,                 Address of Exception handler routine
                    0000   ;                                   from ENKAXK
                    0000   ;   CHECK_STACK : BYTE              Should a check be made for stack corruption?
                    0000   ;
                    0000   ;   INIT_REG : PCB,                 What the registers should contain
                    0000   ;                                   before instruction execution
                    0000   ;   ACTUAL_REG : PCB,               The place where registers are saved
                    0000   ;                                   after the instruction
                    0000   ;   EXPECT_REG : PCB,               What the registers should contain after
                    0000   ;                                   the instruction
                    0000   ;   INIT_PCB : PCB,                 What the pcb contains before the instruction
                    0000   ;   ACTUAL_PCB : PCB,               The place where the Pcb is saved after
                    0000   ;                                   the instruction
                    0000   ;   ABORT : BYTE                    If an error occurs on the stack, stop testing
                    0000   ;   OPR_ABORT: LONG                 Flag to check for abort
                    0000   ;
                    0000   ;******************************************************************************
                    0000   ;
                    0000   ; LOCAL ( For Execute )
                    0000   ;
                    0000
           00000060 0000   TEMP_REGS:      .BLKB 96         ; Holds the contents of the registers
```

```
                                     0060   178                                   ; until Execute finishes its subtest
                           00000000  0060   179 TEMP_PC:          .LONG 0         ; Temporary PC pointer
                           00000000  0064   180 TEMP_PSL::        .LONG 0         ; Temporary process status longword
                  00000000 00000000  0068   181 TEMP_R0:          .QUAD 0         ; Temporary storage for R0 and R1
                           00000000  0070   182 INIT_PSL:         .LONG 0         ; Used to initialize mode and stack for
                                     0074   183                                   ; each subtest
                           00000000  0074   184 INIT_PC:          .LONG 0         ; Determines which instruction will be
                                     0078   185                                   ; executed
                           00000000  0078   186 INST_SP:          .LONG 0         ; The SP the old stack is set to if there
                                     007C   187                                   ; is a stack switch during the instruction
                                 00  007C   188 NULL:             .BYTE 0         ; For null messages in DS_Errhard
                           00000000  007D   189 TEMP_LONGWORD:    .LONG 0         ; Hold fill characters
                           00000000  0081   190 PUSH_PC:          .LONG 0         ; Hold pushed PC and PSL
                           00000000  0085   191 PUSH_PSL:         .LONG 0         ; after LDPCTX.
                  2E 65 6E 6F 4E 00' 0089   192 NONE: .ASCIC 'None.'              ; Used to check against expected exception
                                 05  0089
                           00000000  008F   193 TEMP_SV_PC:       .LONG 0         ; Hold PC and PSL before it is popped
                           00000000  0093   194 TEMP_SV_PSL:      .LONG 0         ; off by SVPCTX
                           00000000  0097   195 TEMP_ESP:         .LONG 0         ; Hold executive stack address
                           00000000  009B   196 TEMP_SSP:         .LONG 0         ; Hold supervisor stack address
                           00000000  009F   197 TEMP_USP:         .LONG 0         ; Hold user stack address
                                     00A3   198
                                     00A3   199 ;
                                     00A3   200 ;     ASCIC INFO AND ERROR MESSAGES
                                     00A3   201 ;
                                     00A3   202
                                     00A3   203
50 44 4C 20 4E 4F 20 4C 49 41 46 00' 00A3   204 CHK_1: .ASCIC 'FAIL ON LDPCTX, stray from kernel stack.'
66 20 79 61 72 74 73 20 2C 58 54 43  00AF
73 20 6C 65 6E 72 65 6B 20 6D 6F 72  00BB
                  2E 6B 63 61 74     00C7
                                 28  00A3
73 20 74 70 75 72 72 65 74 6E 49 00' 00CC   205 CHK_2: .ASCIC 'Interrupt stack corrupted, wrong ISP.'
74 70 75 72 72 6F 63 20 6B 63 61 74  00D8
53 49 20 67 6E 6F 72 77 20 2C 64 65  00E4
                              2E 50  00F0
                                 25  00CC
65 68 63 74 69 77 73 20 74 6F 4E 00' 00F2   206 CHK_21: .ASCIC 'Not switched from Interrupt to Kernel stack.'
72 65 74 6E 49 20 6D 6F 72 66 20 64  00FE
6E 72 65 4B 20 6F 74 20 74 70 75 72  010A
         2E 6B 63 61 74 73 20 6C 65  0116
                                 2C  00F2
73 20 74 70 75 72 72 65 74 6E 49 00' 011F   207 CHK_PC: .ASCIC 'Interrupt stack corrupted,  wrong PC.'
74 70 75 72 72 6F 63 20 6B 63 61 74  012B
50 20 67 6E 6F 72 77 20 20 2C 64 65  0137
                              2E 43  0143
                                 25  011F
63 61 74 73 20 6C 65 6E 72 65 4B 00' 0145   208 CHK_PSL: .ASCIC 'Kernel stack corrupted, wrong PSL.'
2C 64 65 74 70 75 72 72 6F 63 20 6B  0151
   2E 4C 53 50 20 67 6E 6F 72 77 20  015D
                                 22  0145
                                     0168   209
                                 0168   211 .SBTTL  <Subroutines>
                                 0168   212
                                 0168   213 SAVE_REGS :
                                 0168   214 ;
                                 0168   215 ; This routine is called from a macro (Save_R) called from Execute, The
                                 0168   216 ; macro accepts a PCB address as an argument and pushes it on the stack
                                 0168   217 ; Saves the current Registers into the specified PCB. This subtest is
                                 0168   218 ; called at the beginning of Execute to preserve the current registers,
                                 0168   219 ; and again after the instruction under test is executed to store the
                                 0168   220 ; register results in a PCB for later comparison with expected data.
                                 0168   221 ; Save_Regs does not alter any of the registers when executed.
                                 0168   222 ;
                                 0168   223
                                 0168   224
                    03     BB    0168   225             PUSHR   #^M<R0,R1>                  ; Save registers 0 & 1,
                                 016A   226                                                 ; so we can overwrite
            50   0C AE     D0    016A   227             MOVL    12(SP),R0                   ; Set up pointer to PCB,
                                 016E   228                                                 ; below R1 in stack
         10 A0      6E     D0    016E   229             MOVL    (SP), PTX$L_R0 (R0)         ; Move saved R0 into PCB's R0
      14 A0      04 AE     D0    0172   230             MOVL    4(SP), PTX$[_R1(R0)         ; Save R1 into PCB's R1
                                 0177   231 ;
                                 0177   232 ;           If there are no internal processer stack pointers, the next
                                 0177   233 ;           four instructions will merely NOP. So fill up the space with
                                 0177   234 ;           expected data, if the stack pointers exist as internal
                                 0177   235 ;           registers then the MFPR will put the requested data in.
                                 0177   236 ;
          00000000'EF      D0    0177   237             MOVL      EXPECT_REG + PTX$L_KSP,-        ; Fill with expected data for
                    60           017D   238                       PTX$L_KSP(R0)                   ; a transparent possible NOP
               60   00     DB    017E   239             MFPR      #PR$_KSP, PTX$L_KSP(R0)         ; Save internal registers
     00000000'EF    00     DB    0181   240             MFPR      #PR$_KSP, EXPECT_REG + -        ; Save Ksp value in Expect_Reg
                                 0188   241                       PTX$[_KSP
          00000004'EF      D0    0188   242             MOVL      EXPECT_REG + PTX$L_ESP,-
                 04 A0           018E   243                       PTX$L_ESP(R0)
            04 A0   01     DB    0190   244             MFPR      #PR$_ESP, PTX$L_ESP(R0)
          00000008'EF      D0    0194   245             MOVL      EXPECT_REG + PTX$L_SSP,-
                 08 A0           019A   246                       PTX$L_SSP(R0)
            08 A0   02     DB    019C   247             MFPR      #PR$_SSP, PTX$L_SSP(R0)
          0000000C'EF      D0    01A0   248             MOVL      EXPECT_REG + PTX$L_USP,-
                 0C A0           01A6   249                       PTX$L_USP(R0)
            0C A0   03     DB    01A8   250             MFPR      #PR$_USP, PTX$L_USP(R0)
                                 01AC   251
               3FFF 8F     BB    01AC   252             PUSHR     #^X3FFF                         ; Put regs not saved (R2-FP) in
                                 01B0   253                                                       ; memory,and save R0 from being
                                 01B0   254                                                       ; overwritten by MOVC3
   18 A0    08 AE   30     28    01B0   255             MOVC3     #4*12, 8(SP), PTX$L_R2(R0)      ; Copy into PCB specified
               3FFF 8F     BA    01B6   256             POPR      #^X3FFF                         ; Clear the stack after saved
                                 01BA   257
            50 A0   08     DB    01BA   258             MFPR      #PR$_P0BR, PTX$L_P0BR(R0)       ; Save memory management
            54 A0   09     DB    01BE   259             MFPR      #PR$_P0LR, PTX$L_P0LRASTL(R0)   ; registers
               51   13     DB    01C2   260             MFPR      #PR$_ASTLVL, R1                 ; Put ASTLVL data in a temp
         03    18   51     F0    01C5   261             INSV      R1, #PTX$V_ASTLVL, #PTX$S_ASTLVL,-
                 54 A0           01C9   262                       PTX$L_P0LRASTL(R0)              ; then put in longword
            58 A0   0A     DB    01CB   263             MFPR      #PR$_P1BR, PTX$L_P1BR(R0)
            5C A0   0B     DB    01CF   264             MFPR      #PR$_P1LR, PTX$L_P1LRPME(R0)
               51   3D     DB    01D3   265             MFPR      #PR$_PME, R1                    ; Put PME in a temp
         01    1F   51     F0    01D6   266             INSV      R1, #PTX$V_PME, #PTX$S_PME,-    ; then put in longword
                 5C A0           01DA   267                       PTX$L_P1LRPME(R0)
```

```
                  03   BA  01DC          POPR    #^M<R0,R1>            ; Pop all regs saved
                       05  01DE          RSB
                           01DF
                           01DF    ;
                           01DF    ; Loads data into the registers from a Pcb argument pushed on the stack
                           01DF    ;
                           01DF
                           01DF    PUSH_REGS:
                           01DF
             50    04 AE   D0  01DF      MOVL    4(SP),R0              ; Set up pointer to PCB
                           01E3    ;
                           01E3    ;     Push in expected data   If there are no Internal register
                           01E3    ;     stack pointers, the MTPR will be a NOP.  The data in that case
                           01E3    ;     might as well be correct
                           01E3    ;
                           01E3    ;     Don't change the Ksp register, otherwise end up in never-never
                           01E3    ;     land.
                           01E3    ;
                           01E3
    04 A0    00000004'EF   D0  01E3      MOVL    EXPECT_REG + PTX$L_ESP, -
                           01EB              PTX$L_ESP(R0)
             01    04 A0   DA  01EB      MTPR    PTX$L_ESP(R0), #PR$_ESP
                           01EF
    08 A0    00000008'EF   D0  01EF      MOVL    EXPECT_REG + PTX$L_SSP, -
                           01F7              PTX$L_SSP(R0)
             02    08 A0   DA  01F7      MTPR    PTX$L_SSP(R0), #PR$_SSP
                           01FB
    0C A0    0000000C'EF   D0  01FB      MOVL    EXPECT_REG + PTX$L_USP, -
                           0203              PTX$L_USP(R0)
             03    0C A0   DA  0203      MTPR    PTX$L_USP(R0), #PR$_USP
                           0207
                  51   10  D0  0207      MOVL    #PTX$L_AP/4, R1               ; Set counter, do not change FP
                     6041  DD  020A LOOP: PUSHL  (R0)[R1]                      ; Push the PCB's regs onto stack
FFF3 51   FFFFFFFF 8F  06  F1  020D      ACBL    #PTX$L_R2/4, #-1, R1, LOOP
                           0217                                                ; From AP to R2
                  1FFC 8F  BA  0217      POPR    #^X1FFC                       ; Pop the PCB defined regs into the
                           021B                                                ; current registers
                           021B
             08    50 A0   DA  021B      MTPR    PTX$L_P0BR(R0), #PR$_P0BR          ; Save memory management reg.
               16      00  EF  021F      EXTZV   #PTX$V_P0LR, #PTX$S_P0LR,-         ; Put PCB defined P0LR
         51    54 A0           0222              PTX$L_P0LRASTL(R0), R1             ; into R1
               09      51  DA  0225      MTPR    R1, #PR$_P0LR                      ; Put PCB's P0LR into register
               03      18  EF  0228      EXTZV   #PTX$V_ASTLVL, #PTX$S_ASTLVL,-     ; Put PCB defined ASTLVL
         51    54 A0           022B              PTX$L_P0LRASTL(R0), R1             ; into longword temp.
               13      51  DA  022E      MTPR    R1, #PR$_ASTLVL                    ; Put ASTLVL data in register
               0A    58 A0 DA  0231      MTPR    PTX$L_P1BR(R0), #PR$_P1BR          ; Stick P1BR in register
               16      00  EF  0235      EXTZV   #PTX$V_P1LR, #PTX$S_P0LR,-         ; Put PCB defined P1BR
         51    5C A0           0238              PTX$L_P1LRPME(R0), R1              ; in a longword
               0B      51  DA  023B      MTPR    R1, #PR$_P1LR                      ; Put P1BR longwd in reg
    5C A0      01      1F  EF  023E      EXTZV   #PTX$V_PME, #1, PTX$L_P1LRPME(R0),-
                       51      0243              R1                                 ; Make PCB PME a longword
               3D      51  DA  0244      MTPR    R1, #PR$_PME                       ; Put PME longwd in reg
                           0247
             50    10 A0   7D  0247      MOVQ    PTX$L_R0(R0), R0                   ; Put R0 and R1 into regs
                       05  024B          RSB
```

```
        024C      $DS_SBTTL       <Load Process Context>
        024C              .SBTTL  TEST 11:  Load Process Context
        024C              $D2_SBTTL       011,<Load Process Context>,<PAGE>
    00000000              .PSECT  TEST_011, PAGE, NOWRT
        0018
        0018
        0018      ;++
        0018      ; TEST DESCRIPTION:
        0018      ;
        0018      ;
        0018      ; ASSUMPTIONS:
        0018      ;
        0018      ;       The MFPR and MTPR privileged instructions ran successfully.  It
        0018      ;       is also assumed the user is in kernel mode and in standalone.
        0018      ;
        0018      ; TEST STEPS:
        0018      ;
        0018      ;       The Bgntest in this module forces an exception in order to get
        0018      ;       on the interrupt stack.  From the initial exception handler
        0018      ;       TEST_CONTROL which resides in the Bliss module (ENKAXL) is
        0018      ;       called.  TEST_CONTROL fakes a Bgntest in its module in order
        0018      ;       that it may run all of the LDPCTX subtests.
        0018      ;       Each subtest sets up initial and expected data for the registers
        0018      ;       and the Process Control Block which will receive or give data.
        0018      ;       The subtest also requests which stack it will start execution
        0018      ;       off of (through CHECK_STACK) and the mode (Kernel, executive,
        0018      ;       supervisor or user, through MODE) that it wishes to be in at
        0018      ;       the start of the instruction.  After the set up a common EXECUTE
        0018      ;       routine is called.
        0018      ;
        0018      ;       EXECUTE evaluates CHECK_STACK and MODE and sets up a PSL
        0018      ;       accordingly. It sets the PC to the section of code which will
        0018      ;       execute the LDPCTX .
        0018      ;       The new PSL and PC are pushed on the stack and an exception is
        0018      ;       forced.  This causes the PSL and PC on the stack to become
        0018      ;       current so we start the instruction on the desired stack and mode
        0018      ;       and pointing at the correct code.  The flow of execution will
        0018      ;       go to the exception handler (in ENKAXK) regardless of what
        0018      ;       happens in the instruction.  If an expected or unexpected
        0018      ;       exception occurs during execution and control goes to the handler
        0018      ;       otherwise, a breakpoint exception is forced after the instruction.
        0018      ;       The handler records the exception for which it was called in
        0018      ;       Actual_Except or resignals DS if it is unknown.  The handler
        0018      ;       returns to the Save_Results label in Execute. The register
        0018      ;       results are saved in Actual_Regs.  A check is made to ensure
        0018      ;       we landed on the stack desired correctly as specified by the
        0018      ;       SRM. A return code is put in R0, a value of one is normal,
        0018      ;       successful completion.  Execute then returns to the subtest
        0018      ;       it was called from
        0018      ;
        0018      ;         The program aborts if Execute was not successful,  since it
        0018      ;       is likely the stacks will be useless.  If Execute is successful
        0018      ;       Compare_Pcb is called.  Compare_Pcb checks Actual_Pcb against
        0018      ;       Expected_Pcb and Actual_Regs against Expected_Regs.  The routine
        0018      ;       returns Pcb_Err_Flag and Reg_Err_Flag with one or more bits set
        0018      ;       if there are any discrepencies between actual and expected data.
        0018      ;       If there is any difference between actual and expected data or
```

```
                          0018  ;        exception then the subtest calls an error printout routine (in
                          0018  ;        ENKAXK).
                          0018  ;
                          0018  ; ERRORS:
                          0018  ;
                          0018  ;        *** DETAILED DISCRIPTION OF THE ERRORS DETECTABLE AND REPORTED ***
                          0018  ;
                          0018  ;General
                          0018  ;
                          0018  ;        ERRCR 01:  User is not in kernel mode
                          0018  ;        ERROR 02:  Program can not turn memory management off
                          0018  ;                   memory
                          0018  ;        ERROR 03:  Discrepency in Actual and Expected data or exception.
                          0018  ;
                          0018  ;Ldpctx
                          0018  ;
                          0018  ;        ERROR 04:  Did not stay on kernel stack during Ldpctx
                          0018  ;        ERROR 05:  Did not get on to the kernel stack during Ldpctx
                          0018  ;        ERROR 06:  Interrupt stack pointer set incorrectly when switching
                          0018  ;                   to kernel stack on Ldpctx
                          0018  ;        ERROR 07:  Interrupt stack PC not set properly,on Ldpctx
                          0018  ;        ERROR 08:  Kernel stack PSL not set properly, on Ldpctx
                          0018  ;
                          0018  ; DEBUG:
                          0018  ;
                          0018  ;        THIS SECTION WILL CONTAIN INSTRUCTIONS ON HOW TO USE THIS
                          0018  ;        TEST IN DEBUGGING THE UNIT UNDER TEST.
                          0018  ;
                          0018  ;--
                          0018  $DS_BGNTEST     SECTION= <DEFAULT, LDPCTX> REGMASK = <>
                          0018  DATA_011:
              00000000    0018                  .LONG   0                   ; TEST ARGUMENT TABLE TERMINATOR
                          001C  TEST_011::
                  0000    001C                  .WORD   ^M<>                ; ENTRY MASK
                          001E
                          001E
 00000097'EF    01  DB    001E          MFPR    #PR$_ESP, TEMP_ESP          ; Save stack address in
 0000009B'EF    02  DB    0025          MFPR    #PR$_SSP, TEMP_SSP          ; temporary locations
 0000009F'EF    03  DB    002C          MFPR    #PR$_USP, TEMP_USP          ; for later restoration.
                          0033
                          0033  $DS_SETVEC_S    #SCB$L_BREAK, INIT_HNDLR, #1    ; Set up initial BPT
                01  DD    0033                  PUSHL   #1
     00000060'EF    DF    0035                  PUSHAL  INIT_HNDLR
                2C  DD    003B                  PUSHL   #SCB$L_BREAK
 00000000'9F    03  FB    003D                  CALLS   #3, @#DS$SETVEC
                          0044                                              ; instruction handler address
                    03    0044          BPT                                 ; Get a BPT exception that gets
                          0045                                              ; us to a handler that puts us
                          0045                                              ; on the interrupt stack
                          0045  BACK:                                       ;
01   00000097'EF    DA    0045          MTPR    TEMP_ESP, #PR$_ESP          ; Restore stack addresses
02   0000009B'EF    DA    004C          MTPR    TEMP_SSP, #PR$_SSP          ;
03   0000009F'EF    DA    0053          MTPR    TEMP_USP, #PR$_USP          ;
                          005A
              02A8  31    005A          BRW     END_TEST                    ; After the last subtest is done
                          005D                                              ; an REI returns us to here and
                          005D                                              ; the test is over
```

```
                         005D   426 .ALIGN LONG                                      ; DS setvec routine requires it to
                         0060   427                                                  ; be longword aligned
                         0060   428 INIT_HNDLR:
                         0060   429           $DS_CLRVEC_S      #SCB$L_BREAK         ; DS uses this vec so leave it
                2C   DD  0060                             PUSHL     #SCB$L_BREAK
 00000000'9F    01   FB  0062                             CALLS     #1, @#DS$CLRVEC
                         0069   430                                                  ; clean
 00000000'EF    00   FB  0069   431           CALLS     #0, TEST_CONTROL             ; Go to Bliss module and do all
                         0070   432                                                  ; of the subtests, return when
                         0070   433                                                  ; all done
       6E    D2 AF   DE  0070   434           MOVAL     BACK, (SP)                   ; Make sure BPT is not executed again
                         0074   435                                                  ; on the next try
                     02  0074   436           REI                                    ; Return to the instruction following
                         0075   437                                                  ; the BPT instruction
                         0075   438
                         0075   439
                         0075   440
```

```
                                  0075    442 EXECUTE::
                                  0075    443
                                  0075    444 ;
                                  0075    445 ;
                                  0075    446 ;
                                  0075    447 ;
                                  0075    448 ;
                                  0075    449 ; CODE BEGINS
                                  0075    450
                                  0075    451
         00000060'EF    6E    D0  0075    452          MOVL    (SP), TEMP_PC    ; Save PC for restoration at the end of
                                  007C    453                                   ; the subtest
            00000064'EF       DC  007C    454          MOVPSL  TEMP_PSL         ; Save PSL for later restoration
                                  0082    455
                                  0082    456          SAVE_R  TEMP_REGS        ; Save contents of registers for
            00000000'EF       9F  0082                 PUSHAB  TEMP_REGS                ; Put TEMP_REGS address on stack, don't
            00000168'EF       16  0088                 JSB     SAVE_REGS        ; Do the Save_regs routine
                    5E    04  C0  008E                 ADDL2   #4, SP           ; Pop TEMP_REGS address off the stack
                                  0091    457                                   ; restoration after instruction execution
                                  0091    458 ;
                                  0091    459 ;
                                  0091    460 ;*********************************************************************
                                  0091    461 ;
                                  0091    462 ; Set up previous mode for each test case
                                  0091    463 ;
                                  0091    464 ; NOTE: The mode is always kernel for now.
                                  0091    465 ;
                                  0091    466 CHECK_STK:
            00000070'EF       DC  0091    467          MOVPSL  INIT_PSL                   ; Get a normal PSL value
     02   16  00000000'EF     F0  0097    468          INSV    MODE, #PSL$V_PRVMOD, #PSL$S_PRVMOD,-
              00000070'EF         009F    469                  INIT_PSL                   ; Define previous mode as requested
                                  00A4    470                                             ; for each subtest
                                  00A4    471 ;
                                  00A4    472 ;
                                  00A4    473 ;*********************************************************************
                                  00A4    474 ;
                                  00A4    475 ;
                                  00A4    476 ;        Now set up the stacks to kernal or interrupt as requested
                                  00A4    477 ;
                                  00A4    478 ;
         0B 00000000'EF       E9  00A4    479          BLBC    CHECK_STACK, CHK_STK_2 ; If low bit set, Check_Stack is
                                  00AB    480                                         ; one or three so get on
                                  00AB    481                                         ; interrupt stack
                                  00AB    482 ;
                                  00AB    483 ;
                                  00AB    484 ;
 00000070'EF   01   1A   01   F0  00AB    485          INSV    #1, #PSL$V_IS, #1,INIT_PSL        ; The instruction will start
                                  00B4    486                                                    ; on the interrupt stack
                          09  11  00B4    487          BRB     REG_READY
                                  00B6    488 ;
                                  00B6    489 ;
                                  00B6    490 CHK_STK_2:
 00000070'EF   01   1A   00   F0  00B6    491          INSV    #0,#PSL$V_IS, #1,INIT_PSL         ; If low bit clear, Check_stack
                                  00BF    492                                                    ; is zero or two so get on
                                  00BF    493                                                    ; kernal stack
                                  00BF    494 ;
                                  00BF    495 ;
```

```
                                 00BF     496 REG_READY:
                                 00BF     497             PUSH_R   INIT_REG                   ; Set up patterns for
             00000000'EF    9F   00BF                     PUSHAB   INIT_REG                   ; Put INIT_REG address on stack as parameter
             000001DF'EF    16   00C5                     JSB      PUSH_REGS         ; Do Push_regs routine
                   5E  04   C0   00CB                     ADDL2    #4, SP            ; Clean off stack
                                 00CE     498                                        ; subtests into the regs
                                 00CE     499 ;
                                 00CE     500 ;
                                 00CE     501
                                 00CE     502
     00000074'EF   00000111'EF   DE   00CE     503        MOVAL    LDPCTX_PC, INIT_PC         ; Otherwise go to LDPCTX instruction
                                 00D9     504                                             ; after general instruction set-up
                                 00D9     505 ;
                                 00D9     506 ;
                                 00D9     507 ;***************************************************************************
                                 00D9     508 ;
                                 00D9     509 ;
                                 00D9     510 ;
                                 00D9     511 ; Set up an exception handler to get us on the interrupt stack so we
                                 00D9     512 ; can change the IS bit in the current PSL
                                 00D9     513
          00000068'EF    50    7D   00D9     514          MOVQ     R0,TEMP_R0                 ; Save R0, R1
                                 00E0     515 ;
                                 00E0     516             $DS_SETVEC_S     #SCB$L_BREAK, ISTK_HNDLR, #1
                          01    DD   00E0                          PUSHL    #1
             000000F4'EF    DF   00E2                              PUSHAL   ISTK_HNDLR
                          2C    DD   00E8                          PUSHL    #SCB$L_BREAK
          00000000'9F    03    FB   00EA                           CALLS    #3, @#DS$SETVEC
                          03   00F1     517             BPT                                 ; Sets up stack and mode according
                                 00F2     518                                             ; to PSL then goes to LDPCTX or
                                 00F2     519                                             ; SVPCTX instruct
                                 00F2     520             .ALIGN LONG                     ; DS Exception likes the handler
                                 00F4     521                                             ; longword aligned
                                 00F4     522 ISTK_HNDLR:
                                 00F4     523             $DS_CLRVEC_S     #SCB$L_BREAK     ; Don't end up here on next BPT
                          2C    DD   00F4                          PUSHL    #SCB$L_BREAK
          00000000'9F    01    FB   00F6                           CALLS    #1, @#DS$CLRVEC
          6E   00000074'EF    D0   00FD     524             MOVL     INIT_PC, (SP)            ; Go to right instruction code
       04 AE   00000070'EF    D0   0104     525             MOVL     INIT_PSL, 4(SP)          ; Be in the correct mode and
                                 010C     526                                             ; stack when you get there
                          02   010C     527             REI                                 ; Get to the instruction-under-test
                                 010D     528
                   5A5A5A5A   010D     529             .LONG    ^X5A5A5A5A                 ; If PC is off by a few bits
                                 0111     530                                             ; these buffers stop the instruction
                                 0111     531 ;
                                 0111     532 ;
                                 0111     533 ;*****************************************************************************
                                 0111     534 ;
                                 0111     535 ;
                                 0111     536 LDPCTX_PC:
     50   00000068'EF    7D   0111     537             MOVQ     TEMP_R0, R0                ; Save R0, R1
                                 0118     538 ;
          00000078'EF    5E    D0   0118     539          MOVL     SP, INST_SP                ; Save stack pointer before LDPCTX
                                 011F     540 ;
                                 011F     541 ; Set up PSL for new process
                                 011F     542 ;
          0000004C'EF    DC   011F     543             MOVPSL   ACTUAL_PCB + PTX$L_PSL
```

```
                                0125    544 ;
                                0125    545 ; Set up FP, KSP, & PC for new process
                                0125    546 ;
         00000044'EF   5D   D0  0125    547         MOVL    FP, ACTUAL_PCB + PTX$L_FP
                                012C    548
         00000000'EF   00   DB  012C    549         MFPR    #PR$_KSP, ACTUAL_PCB + PTX$L_KSP
                                0133    550
   00000048'EF   00000153'EF   D0  0133    551         MOVL    LD_PC, ACTUAL_PCB + PTX$L_PC
                                013E    552 ;
                                013E    553 ;*****************************************************************
                                013E    554 ;
00000000'EF   00000089'EF   05   29  013E    555         CMPC3   #5, NONE, @EXPECTED_EXCEPT      ; Check if excepton is expected
                         07   13  014A    556         BEQL    LD_PC                   ; If not , execute LDPCTX
         6D   00000000'EF   DE  014C    557         MOVAL   HANDLER, (FP)           ; Othewiswe enable handler
                                0153    558                                         ; This makes sure the handler is
                                0153    559                                         ; is set up just before it is used
                                0153    560
                                0153    561 ;
                                0153    562 ;*****************************************************************
                                0153    563 ;
                                0153    564 LD_PC:
                           06   0153    565         LDPCTX                          ; Execute Load process context
                                0154    566 ;
         00000081'EF   8E   D0  0154    567         MOVL    (SP)+,PUSH_PC           ; Save pushed PC
         00000085'EF   8E   D0  015B    568         MOVL    (SP)+,PUSH_PSL          ; Save pushed PSL
                                0162    569
                                0162    570 ;
                                0162    571 ;*****************************************************************
                                0162    572 ;
                                0162    573 ;
         6D   00000000'EF   DE  0162    574         MOVAL   HANDLER, (FP)           ; Enable handler
                                0169    575
                           03   0169    576         BPT                             ; Go to the exception handler if
                                016A    577                                         ; didn't get an exception from LDPCTX
                                016A    578                                         ; Return to Save_Results
                     5A5A5A5A   016A    579         .LONG   ^X5A5A5A5A
                                016E    580 ;
                                016E    581 ;*****************************************************************
                                016E    582 ;
                                016E    583 ;
                                016E    584 SAVE_RESULTS::                          ; Global, referenced in ENKAXK
                                016E    585         SAVE_R  ACTUAL_REG
           00000000'EF   9F     016E            PUSHAB  ACTUAL_REG              ; Put ACTUAL_REG address on stack, don't
           00000168'EF   16     0174            JSB     SAVE_REGS       ; Do the Save_regs routine
                  5E   04   C0  017A            ADDL2   #4, SP          ; Pop ACTUAL_REG address off the stack
                                017D    586                                         ; registers is saved into Actual_Reg
                                017D    587 ;
                                017D    588 ;*****************************************************************
                                017D    589 ;
                                017D    590 ; Check status after instruction execution to make sure the instruction
                                017D    591 ; ended up in the right state .
                                017D    592 ;
                                017D    593 CHK_STK_RSLT:
                                017D    594 ;
                                017D    595 ;
    0000000C'EF   01   1A   EF  017D    596         EXTZV   #PSL$V_IS, #1, -        ; Get Interrupt Stack status from
                         51     0185    597                 ACTUAL_PSL,R1           ; PSL saved after instr, leave in R1
```

```
                                     0186   598 ;
                                     0186   599 ;*******************************************************************************
                                     0186   600 ;
                                     0186   601 ;
                                     0186   602 ;
                                     0186   603 ;
                                     0186   604 ; Check if started on the kernal stack and ended on the kernal stack
                                     0186   605 ;
                                     0186   606
           02   00000000'EF    91    0186   607             CMPB    CHECK_STACK, #2         ; Check if Check_Stack = 2
                         32    12    018D   608             BNEQ    CHK_STK_3               ; if not Check_stack = 3
                      2C 51    E9    018F   609             BLBC    R1, 65$                 ; If psl<is> is set then we
                                     0192   610                                             ; strayed from kernel stack
                                     0192   611             $DS_ERRHARD_S MSGADR = CHK_1,-
                                     0192   612                                   PRLINK = PRINT_ERR,-
                                     0192   613                                   P1 = #NULL,-
                                     0192   614                                   P2 = EXPECTED_EXCEPT,-
                                     0192   615                                   P3 = ACTUAL_EXCEPT
                00000000'EF    DD    0192                           PUSHL   ACTUAL_EXCEPT
                00000000'EF    DD    0198                           PUSHL   EXPECTED_EXCEPT
                0000007C'8F    DD    019E                           PUSHL   #NULL
                00000000'EF    DF    01A4                           PUSHAL  PRINT_ERR
                000000A3'EF    DF    01AA                           PUSHAL  CHK_1
                         00    DD    01B0                           PUSHL   #0
                         01    DD    01B2                           PUSHL   #$ER
                                     01B4           ;;; TEST 11, SUBTEST 0, ERROR 1
           00000000'9F   07    FB    01B4                           CALLS   #$$M, @#DS$ERRHARD
                       00EB    31    01BB   616             BRW     ABORTS
                       0040    31    01BE   617 65$:        BRW     L_END
                                     01C1   618 ;
                                     01C1   619 ;*******************************************************************************
                                     01C1   620 ;
                                     01C1   621 ;
                                     01C1   622 ; Check if stared on interrupt stack and ended on kernal stack
                                     01C1   623 ;
                                     01C1   624 CHK_STK_3:
                                     01C1   625
           0000007D'EF   04    DB    01C1   626             MFPR    #PR$_ISP, TEMP_LONGWORD
00000078'EF   0000007D'EF    D1    01C8   627             CMPL    TEMP_LONGWORD, INST_SP
                         2C    13    01D3   628             BEQL    L_END
                                     01D5   629             $DS_ERRHARD_S MSGADR = CHK_2,-
                                     01D5   630                           PRLINK = PRINT_ERR,-
                                     01D5   631                           P1 = #NULL,-
                                     01D5   632                           P2 = EXPECTED_EXCEPT,-
                                     01D5   633                           P3 = ACTUAL_EXCEPT
                00000000'EF    DD    01D5                           PUSHL   ACTUAL_EXCEPT
                00000000'EF    DD    01DB                           PUSHL   EXPECTED_EXCEPT
                0000007C'8F    DD    01E1                           PUSHL   #NULL
                00000000'EF    DF    01E7                           PUSHAL  PRINT_ERR
                000000CC'EF    DF    01ED                           PUSHAL  CHK_2
                         00    DD    01F3                           PUSHL   #0
                         02    DD    01F5                           PUSHL   #$ER
                                     01F7           ;;; TEST 11, SUBTEST 0, ERROR 2
           00000000'9F   07    FB    01F7                           CALLS   #$$M, @#DS$ERRHARD
                       00A8    31    01FE   634             BRW     ABORTS
                                     0201   635 ;
                                     0201   636 ; Check if ended on kernal stack
```

```
                                    0201    637 ;
                                    0201    638 L_END:
                 00000000'EF    D5  0201    639             TSTL    OPR_ABORT             ;Check if reserved operand
                                    0207    640                                           ;occured.
                          2F    12  0207    641             BNEQ    15$                   ;If not  equal then PSL is no good
                       2F 51    E9  0209    642             BLBC    R1, 20$               ; If PSL<IS> is set then there was no
                                    020C    643                                           ; switch to kernel stack
                                    020C    644             $DS_ERRHARD_S MSGADR = CHK_21,-
                                    020C    645                                   PRLINK = PRINT_ERR,-
                                    020C    646                                   P1 = #NULL,-
                                    020C    647                                   P2 = EXPECTED_EXCEPT,-
                                    020C    648                                   P3 = ACTUAL_EXCEPT
                 00000000'EF    DD  020C                        PUSHL   ACTUAL_EXCEPT
                 00000000'EF    DD  0212                        PUSHL   EXPECTED_EXCEPT
                 0000007C'8F    DD  0218                        PUSHL   #NULL
                 00000000'EF    DF  021E                        PUSHAL  PRINT_ERR
                 000000F2'EF    DF  0224                        PUSHAL  CHK_21
                          00    DD  022A                        PUSHL   #0
                          03    DD  022C                        PUSHL   #$ER
                                    022E        ;;; TEST 11, SUBTEST 0, ERROR 3
            00000000'9F   07    FB  022E                        CALLS   #$$M, @#DS$ERRHARD
                        0071    31  0235    649             BRW     ABORTS
                                    0238    650 ;
                                    0238    651 ;*************************************************************************************
                                    0238    652 ;
                                    0238    653 ;
                                    0238    654 ; Check pushed PC & PSL during LDPCTX operation
                                    0238    655 ;
                        0072    31  0238    656 15$:        BRW     ENDS
                                    023B    657 20$:
                                    023B    658
    00000048'EF    00000081'EF  D1  023B    659             CMPL    PUSH_PC, ACTUAL_PCB + PTX$L_PC  ; Get pushed PC, does it
                                    0246    660                                                     ; it match PC in PCB
                          2B    13  0246    661             BEQL    30$
                                    0248    662             $DS_ERRHARD_S MSGADR = CHK_PC,-
                                    0248    663                           PRLINK = PRINT_ERR,-
                                    0248    664                           P1 = #NULL,-
                                    0248    665                           P2 = EXPECTED_EXCEPT,-
                                    0248    666                           P3 = ACTUAL_EXCEPT
                 00000000'EF    DD  0248                        PUSHL   ACTUAL_EXCEPT
                 00000000'EF    DD  024E                        PUSHL   EXPECTED_EXCEPT
                 0000007C'8F    DD  0254                        PUSHL   #NULL
                 00000000'EF    DF  025A                        PUSHAL  PRINT_ERR
                 0000011F'EF    DF  0260                        PUSHAL  CHK_PC
                          00    DD  0266                        PUSHL   #0
                          04    DD  0268                        PUSHL   #$ER
                                    026A        ;;; TEST 11, SUBTEST 0, ERROR 4
            00000000'9F   07    FB  026A                        CALLS   #$$M, @#DS$ERRHARD
                          36    11  0271    667             BRB     ABORTS
                                    0273    668 ;
                                    0273    669 30$:
    0000004C'EF    00000085'EF  D1  0273    670             CMPL    PUSH_PSL, ACTUAL_PCB + PTX$L_PSL ; Get pushed PSL, should
                                    027E    671                                                      ; match the one in PCB created
                          2D    13  027E    672             BEQL    ENDS
                                    0280    673             $DS_ERRHARD_S MSGADR = CHK_PSL-
                                    0280    674                           PRLINK = PRINT_ERR,-
                                    0280    675                           P1 = #NULL,-
                       0280   676                       P2 = EXPECTED_EXCEPT,-
                       0280   677                       P3 = ACTUAL_EXCEPT
     00000000'EF  DD   0280                       PUSHL   ACTUAL_EXCEPT
     00000000'EF  DD   0286                       PUSHL   EXPECTED_EXCEPT
     0000007C'8F  DD   028C                       PUSHL   #NULL
     00000000'EF  DF   0292                       PUSHAL  PRINT_ERR
     00000145'EF  DF   0298                       PUSHAL  CHK_PSL
              00  DD   029E                       PUSHL   #0
              05  DD   02A0                       PUSHL   #$ER
                       02A2       ;;; TEST 11, SUBTEST 0, ERROR 5
00000000'9F   07  FB   02A2                       CALLS   #$$M, @#DS$ERRHARD
                       02A9   678 ; End of status check
                       02A9   679 ;
                       02A9   680 ;****************************************************************************
                       02A9   681 ;
                       02A9   682
                       02A9   683 ;
                       02A9   684 ; If EXECUTE fails
                       02A9   685 ;
              50  94   02A9   686 ABORTS: CLRB    R0                      ; Failed to complete normally
              03  11   02AB   687         BRB     EXIT
                       02AD   688
                       02AD   689 ;
                       02AD   690 ; If EXECUTE passes
                       02AD   691 ;
         50   01  D0   02AD   692 ENDS:   MOVL    #1, R0                  ; Normal successful completion
                       02B0   693
                       02B0   694 ;
                       02B0   695 ; Restore registers saved , before EXECUTE was called
                       02B0   696 ;
00000010'EF   50  D0   02B0   697 EXIT:   MOVL    R0, TEMP_REGS + PTX$L_R0        ; Put current value of
                       02B7   698                                         ; R0 in registers that will return
00000068'EF   50  D0   02B7   699         MOVL    R0,TEMP_R0              ; Save return status for Execute
                       02BE   700         PUSH_R  TEMP_REGS               ; Restore the registers as they
     00000000'EF  9F   02BE               PUSHAB  TEMP_REGS               ; Put TEMP_REGS address on stack as paramete
     000001DF'EF  16   02C4               JSB     PUSH_REGS       ; Do Push_regs routine
          5E  04  C0   02CA               ADDL2   #4, SP          ; Clean off stack
                       02CD   701                                         ; were when Execute was called
                       02CD   702
                       02CD   703 ;
                       02CD   704 ; Set up stack to return from EXECUTE
                       02CD   705 ;
                       02CD   706         $DS_SETVEC_S    #SCB$L_BREAK,-  ; Get on interrupt stack so we
                       02CD   707                         END_HANDLR, #1  ; can change back to the stack
              01  DD   02CD                       PUSHL   #1
     000002E8'EF  DF   02CF                       PUSHAL  END_HANDLR
              2C  DD   02D5                       PUSHL   #SCB$L_BREAK
00000000'9F   03  FB   02D7                       CALLS   #3, @#DS$SETVEC
                       02DE   708                                         ; we started Execute on.
                  03   02DE   709         BPT                             ; Go to End_Handlr
                       02DF   710 RETURN:
6E   00000060'EF  D0   02DF   711         MOVL    TEMP_PC, (SP)           ; Restore saved PC
                  05   02E6   712         RSB                             ; Return to the subtest that called
                       02E7   713
                       02E7   714         .ALIGN LONG
                       02E8   715
                       02E8   716 END_HANDLR:
                               02E8   717         $DS_CLRVEC_S    #SCB$L_BREAK       ; Let DS take care of any
                      2C   DD  02E8                        PUSHL  #SCB$L_BREAK
        00000000'9F   01   FB  02EA                        CALLS  #1, @#DS$CLRVEC
                               02F1   718                                            ; unexpected exceptions from here
        50   00000068'EF   D0  02F1   719         MOVL     TEMP_R0, R0               ; Reload status saved
                               02F8   720 ;
                               02F8   721 ; Set up PSL for proper return
                               02F8   722 ;
     04 AE   00000064'EF   D0  02F8   723         MOVL     TEMP_PSL, 4(SP)           ; Put the PSL stack and mode back
             6E    DC AF   DE  0300   724         MOVAL    RETURN, (SP)              ; like we found it
                           02  0304   725         REI
                               0305   726
                               0305   727 ; Time to get out of Execute
                               0305   728
                               0305   729
                               0305   730 ;**************************************************************************
                               0305   731 ;                            END      OF      TEST
                               0305   732 ;**************************************************************************
                               0305   733
                               0305   734 END_TEST:
                               0305   735
                               0305   736 $DS_ENDTEST                                    ; End of test
                 50   01   D0  0305                        MOVL   #1, R0             ; NORMAL EXIT
                               0308       TEST_011_X::
        00000000'9F   6E   FA  0308                        CALLG  (SP), @#DS$BREAK
                           04  030F                        RET                       ; RETURN TO TEST SEQUENCER
                               0310   737
                               0310   738 $DS_ENDMOD                                     ; End of module
                          00000000                         .PSECT $TSTCNT, NOEXE, NOWRT, OVR, LONG
                     0000000B  0000                        .LONG  $TN
                               0004   739
                               0004   740 .END
```

```
$$$                             = 00000000                    DSA$M_BELL                      = 00000008
$$M                             = 00000007                    DSA$M_BINARY                    = 00000002
$$N                             = 00000001                    DSA$M_CRD_AUTOTEST              = 00000800
$$S                             = FFFFFFFF                    DSA$M_CRD_MENUTEST              = 00010000
$ENV                            = 00000001  G                 DSA$M_CRD_TRACE                 = 00020000
$ER                             = FFFFFFFF                    DSA$M_DEBUG                     = 04000000
$MO                             = 00000001  G                 DSA$M_HALT                      = 00000001
$ST                             = 00000000                    DSA$M_IE1                       = 00000010
$TN                             = 0000000B                    DSA$M_IE2                       = 00000020
ABORTS                            000002A9 R      03          DSA$M_IE3                       = 00000040
ACTUAL_EXCEPT                     ********   X    03          DSA$M_IES                       = 00000080
ACTUAL_PCB                        ********   X    03          DSA$M_LOAD_DEBUGGER             = 40000000
ACTUAL_PSL                        ********   X    03          DSA$M_LOOP                      = 00000004
ACTUAL_REG                        ********   X    03          DSA$M_NORPT                     = 08000000
ALL                             = 00000008  G                 DSA$M_OPER                      = 00001000
BACK                              00000045 R      03          DSA$M_PASSO                     = 20000000
BASE_011                          00000000 R      03          DSA$M_PROMPT                    = 00002000
BIT...                          = 00000002                    DSA$M_QA                        = 00008000
CEP_FUNCTIONAL                  = 00000000                    DSA$M_QUICK                     = 00000100
CEP_REPAIR                      = 00000001                    DSA$M_SEARCH                    = 00004000
CHECK_STACK                       ********   X    03          DSA$M_TRACE                     = 00000400
CHECK_STK                         00000091 R      03          DSA$M_USER                      = 10000000
CHK_1                             000000A3 R      01          DSA$M_VERIFY                    = 00000200
CHK_2                             000000CC R      01          DSA$V_APT                       = 0000001F
CHK_21                            000000F2 R      01          DSA$V_BELL                      = 00000003
CHK_PC                            0000011F R      01          DSA$V_BINARY                    = 00000001
CHK_PSL                           00000145 R      01          DSA$V_CRD_AUTOTEST              = 0000000B
CHK_STK_2                         000000B6 R      03          DSA$V_CRD_MENUTEST              = 00000010
CHK_STK_3                         000001C1 R      03          DSA$V_CRD_TRACE                 = 00000011
CHK_STK_RSLT                      0000017D R      03          DSA$V_DEBUG                     = 0000001A
CPU$V_COMET                     = 00000002                    DSA$V_HALT                      = 00000000
CPU$V_HS                        = 00000000                    DSA$V_IE1                       = 00000004
CPU$V_STAR                      = 00000001                    DSA$V_IE2                       = 00000005
DATA_011                          00000018 R      03          DSA$V_IE3                       = 00000006
DEFAULT                         = 00000000  G                 DSA$V_IES                       = 00000007
DS$BREAK                          ********   X    03          DSA$V_LOAD_DEBUGGER             = 0000001E
DS$CLRVEC                         ********   X    03          DSA$V_LOOP                      = 00000002
DS$ERRHARD                        ********   X    03          DSA$V_NORPT                     = 0000001B
DS$SETVEC                         ********   X    03          DSA$V_OPER                      = 0000000C
DSA$AL_APTMAIL                    0000FE00                    DSA$V_PASSO                     = 0000001D
DSA$AT_APTTXT                     0000FA00                    DSA$V_PROMPT                    = 0000000D
DSA$GL_APTCOM                     0000FE04                    DSA$V_QA                        = 0000000F
DSA$GL_DEVLEN                     0000FE58                    DSA$V_QUICK                     = 00000008
DSA$GL_ERRNO                      0000FE44                    DSA$V_SEARCH                    = 0000000E
DSA$GL_EVENT                      0000FE48                    DSA$V_TRACE                     = 0000000A
DSA$GL_FLAGS                      0000FE00                    DSA$V_USER                      = 0000001C
DSA$GL_MSGTYP                     0000FE40                    DSA$V_VERIFY                    = 00000009
DSA$GL_PASSES                     0000FE08                    ENDS                              000002AD R      03
DSA$GL_PASSNO                     0000FE54                    END_HANDLR                        000002E8 R      03
DSA$GL_SECTNO                     0000FE10                    END_TEST                          00000305 R      03
DSA$GL_SID                        0000FE14                    ENV$M_DOMAIN                    = 00000002
DSA$GL_SUBTNO                     0000FE4C                    ENV$M_LEVEL                     = 00000001
DSA$GL_TESTNO                     0000FE50                    ENV$M_SUPER                     = 000003FC
DSA$GL_UNITS                      0000FE0C                    ENV$S_DOMAIN                    = 00000001
DSA$GQ_MSGPTR                     0000FE68                    ENV$S_LEVEL                     = 00000001
DSA$GT_DEVNAM                     0000FE5C                    ENV$S_SUPER                     = 00000008
DSA$M_APT                       = 80000000                    ENV$V_DOMAIN                    = 00000001
```

```
ENV$V_LEVEL                    = 00000000                PR$_IPL                        = 00000012
ENV$V_SUPER                    = 00000002                PR$_ISP                        = 00000004
ENV$_CPU                       = 00000000                PR$_KSP                        = 00000000
ENV$_FUNCTIONAL                = 00000000                PR$_MAPEN                      = 00000038
ENV$_REPAIR                    = 00000001                PR$_MCESR                      = 00000026
ENV$_SUPER                     = 00000001                PR$_MCTL1                      = 00000044
ENV$_SYSTEM                    = 00000001                PR$_MCTL2                      = 00000045
EXECUTE                          00000075 RG    03       PR$_MDCR1                      = 00000049
EXIT                             000002B0 R     03       PR$_MEAR                       = 00000048
EXPECTED_EXCEPT                  ********   X   03       PR$_MECCR                      = 0000004B
EXPECT_REG                       ********   X   01       PR$_MEDR                       = 0000004A
HALT                           = 00000004  G             PR$_MGEN                       = 00000046
HANDLER                          ********   X   03       PR$_MTBER                      = 00000047
INIT_HNDLR                       00000060 R     03       PR$_NICR                       = 00000019
INIT_PC                          00000074 R     01       PR$_P0BR                       = 00000008
INIT_PSL                         00000070 R     01       PR$_P0LR                       = 00000009
INIT_REG                         ********   X   03       PR$_P1BR                       = 0000000A
INST_SP                          00000078 R     01       PR$_P1LR                       = 0000000B
IPR                            = 00000006  G             PR$_PAMACC                     = 00000040
ISTK_HNDLR                       000000F4 R     03       PR$_PAMLOC                     = 00000041
LDPCTX                         = 0000000B  G             PR$_PCBB                       = 00000010
LDPCTX_PC                        00000111 R     03       PR$_PME                        = 0000003D
LD_PC                            00000153 R     03       PR$_RXCS                       = 00000020
LOOP                             0000020A R     01       PR$_RXDB                       = 00000021
L_END                            00000201 R     03       PR$_SBIER                      = 00000034
MANUAL                         = 00000001  G             PR$_SBIFS                      = 00000030
MCHK                           = 00000005  G             PR$_SBIMT                      = 00000033
MEM                            = 00000009  G             PR$_SBIQC                      = 00000036
MODE                             ********   X   03       PR$_SBIS                       = 00000031
MSG_011                          00000002 R     03       PR$_SBISC                      = 00000032
NONE                             00000089 R     01       PR$_SBITA                      = 00000035
NULL                             0000007C R     01       PR$_SBR                        = 0000000C
OPR_ABORT                        ********   X   03       PR$_SCBB                       = 00000011
POWER                          = 00000003  G             PR$_SID                        = 0000003E
PR$S_SID_ECO                   = 00000009                PR$_SID_TYP730                 = 00000003
PR$S_SID_PL                    = 00000003                PR$_SID_TYP750                 = 00000002
PR$S_SID_SN                    = 0000000C                PR$_SID_TYP780                 = 00000001
PR$S_SID_TYPE                  = 00000008                PR$_SID_TYP7VV                 = 00000004
PR$V_SID_ECO                   = 0000000F                PR$_SID_TYPMAX                 = 00000004
PR$V_SID_PL                    = 0000000C                PR$_SIRR                       = 00000014
PR$V_SID_SN                    = 00000000                PR$_SISR                       = 00000015
PR$V_SID_TYPE                  = 00000018                PR$_SLR                        = 0000000D
PR$_ACCR                       = 00000029                PR$_SSP                        = 00000002
PR$_ACCS                       = 00000028                PR$_TBCHK                      = 0000003F
PR$_ASTLVL                     = 00000013                PR$_TBDR                       = 00000024
PR$_CADR                       = 00000025                PR$_TBIA                       = 00000039
PR$_CAER                       = 00000027                PR$_TBIS                       = 0000003A
PR$_CMIERR                     = 00000017                PR$_TODR                       = 0000001B
PR$_CRBT                       = 00000043                PR$_TXCS                       = 00000022
PR$_CSRD                       = 0000001D                PR$_TXDB                       = 00000023
PR$_CSRS                       = 0000001C                PR$_UBRESET                    = 00000037
PR$_CSTD                       = 0000001F                PR$_USP                        = 00000003
PR$_CSTS                       = 0000001E                PR$_WCSA                       = 0000002C
PR$_CSWP                       = 00000042                PR$_WCSD                       = 0000002D
PR$_ESP                        = 00000001                PRINT_ERR                        ********   X   03
PR$_ICCS                       = 00000018                PSL$C_EXEC                     = 00000001
PR$_ICR                        = 0000001A                PSL$C_KERNEL                   = 00000000
```

```
PSL$C_SUPER                      = 00000002          PTX$L_R8                           00000030
PSL$C_USER                       = 00000003          PTX$L_R9                           00000034
PSL$M_C                          = 00000001          PTX$L_SSP                          00000008
PSL$M_CM                         = 80000000          PTX$L_USP                          0000000C
PSL$M_CURMOD                     = 03000000          PTX$S_ASTLVL                     = 00000003
PSL$M_DV                         = 00000080          PTX$S_MBZ1                       = 00000002
PSL$M_FPD                        = 08000000          PTX$S_MBZ2                       = 00000005
PSL$M_FU                         = 00000040          PTX$S_MBZ3                       = 00000009
PSL$M_IPL                        = 001F0000          PTX$S_P0LR                       = 00000016
PSL$M_IS                         = 04000000          PTX$S_P1LR                       = 00000016
PSL$M_IV                         = 00000020          PTX$S_PME                        = 00000001
PSL$M_N                          = 00000008          PTX$V_ASTLVL                     = 00000018
PSL$M_PRVMOD                     = 00C00000          PTX$V_MBZ1                       = 00000016
PSL$M_SAFBITS                    = 000037FF          PTX$V_MBZ2                       = 0000001B
PSL$M_TBIT                       = 00000010          PTX$V_MBZ3                       = 00000016
PSL$M_TP                         = 40000000          PTX$V_P0LR                       = 00000000
PSL$M_V                          = 00000002          PTX$V_P1LR                       = 00000000
PSL$M_Z                          = 00000004          PTX$V_PME                        = 0000001F
PSL$S_CURMOD                     = 00000002          PUSH_PC                            00000081 R     01
PSL$S_IPL                        = 00000005          PUSH_PSL                           00000085 R     01
PSL$S_PRVMOD                     = 00000002          PUSH_REGS                          000001DF R     01
PSL$V_C                          = 00000000          REG_READY                          000000BF R     03
PSL$V_CM                         = 0000001F          RETURN                             000002DF R     03
PSL$V_CURMOD                     = 00000018          SAVE_REGS                          00000168 R     01
PSL$V_DV                         = 00000007          SAVE_RESULTS                       0000016E RG    03
PSL$V_FPD                        = 0000001B          SCB$L_ACCESS                       00000020
PSL$V_FU                         = 00000006          SCB$L_ARITH                        00000034
PSL$V_IPL                        = 00000010          SCB$L_BREAK                        0000002C
PSL$V_IS                         = 0000001A          SCB$L_CHME                         00000044
PSL$V_IV                         = 00000005          SCB$L_CHMK                         00000040
PSL$V_N                          = 00000003          SCB$L_CHMS                         00000048
PSL$V_PRVMOD                     = 00000016          SCB$L_CHMU                         0000004C
PSL$V_TBIT                       = 00000004          SCB$L_COMPAT                       00000030
PSL$V_TP                         = 0000001E          SCB$L_KNLSTK                       00000008
PSL$V_V                          = 00000001          SCB$L_MACHCHK                      00000004
PSL$V_Z                          = 00000002          SCB$L_OPCCUS                       00000014
PTX$K_SIZE                         00000060          SCB$L_OPCDEC                       00000010
PTX$L_AP                           00000040          SCB$L_POWER                        0000000C
PTX$L_ESP                          00000004          SCB$L_RADRMOD                      0000001C
PTX$L_FP                           00000044          SCB$L_ROPRAND                      00000018
PTX$L_KSP                          00000000          SCB$L_RXDB                         000000F8
PTX$L_P0BR                         00000050          SCB$L_SFTLVL1                      00000084
PTX$L_P0LRASTL                     00000054          SCB$L_SFTLVL10                     000000A8
PTX$L_P1BR                         00000058          SCB$L_SFTLVL11                     000000AC
PTX$L_P1LRPME                      0000005C          SCB$L_SFTLVL12                     000000B0
PTX$L_PC                           00000048          SCB$L_SFTLVL13                     000000B4
PTX$L_PSL                          0000004C          SCB$L_SFTLVL14                     000000B8
PTX$L_R0                           00000010          SCB$L_SFTLVL15                     000000BC
PTX$L_R1                           00000014          SCB$L_SFTLVL2                      00000088
PTX$L_R10                          00000038          SCB$L_SFTLVL3                      0000008C
PTX$L_R11                          0000003C          SCB$L_SFTLVL4                      00000090
PTX$L_R2                           00000018          SCB$L_SFTLVL5                      00000094
PTX$L_R3                           0000001C          SCB$L_SFTLVL6                      00000098
PTX$L_R4                           00000020          SCB$L_SFTLVL7                      0000009C
PTX$L_R5                           00000024          SCB$L_SFTLVL8                      000000A0
PTX$L_R6                           00000028          SCB$L_SFTLVL9                      000000A4
PTX$L_R7                           0000002C          SCB$L_TBIT                         00000028
```

```
SCB$L_TIMER                          000000C0
SCB$L_TRANSL                         00000024
SCB$L_TXDB                           000000FC
SCB$L_ZERO                           00000000
SEP_FUNCTIONAL                     = 00000002
SEP_REPAIR                         = 00000003
SIZ...                             = 00000008
TEMP_ESP                             00000097 R      01
TEMP_LONGWORD                        0000007D R      01
TEMP_PC                              00000060 R      01
TEMP_PSL                             00000064 RG     01
TEMP_R0                              00000068 R      01
TEMP_REGS                            00000000 R      01
TEMP_SSP                             0000009B R      01
TEMP_SV_PC                           0000008F R      01
TEMP_SV_PSL                          00000093 R      01
TEMP_USP                             0000009F R      01
TEST_011                             0000001C RG     03
TEST_011_X                           00000308 RG     03
TEST_CONTROL                         ********   X    03
TU58                               = 00000002  G
UBI                                = 0000000A  G
WCS                                = 00000007  G

                                                   +----------------+
                                                   ! Psect synopsis !
                                                   +----------------+

PSECT name                          Allocation           PSECT No.  Attributes
----------                          ----------           ---------  ----------
.  ABS  .                           00000000  (     0.)  00 (  0.)  NOPIC    USR    CON    ABS    LCL NOSHR NOEXE NORD   NOWRT NOVEC BYTE
. BLANK .                           0000024C  (   588.)  01 (  1.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
$ABS$                               0000FE70  (65136.)  02 (  2.)  NOPIC    USR    CON    ABS    LCL NOSHR   EXE   RD     WRT NOVEC BYTE
TEST_011                            00000310  (   784.)  03 (  3.)  NOPIC    USR    CON    REL    LCL NOSHR   EXE   RD   NOWRT NOVEC PAGE
DISPATCH                            00000018  (    24.)  04 (  4.)  NOPIC    USR    CON    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
$TSTCNT                             00000004  (     4.)  05 (  5.)  NOPIC    USR    OVR    REL    LCL NOSHR NOEXE   RD   NOWRT NOVEC LONG
```

```
                                                +--------------------------+
                                                ! Symbol Cross Reference !
                                                +--------------------------+
SYMBOL                              VALUE       DEFINITION    REFERENCES...
------                              -----       ----------    -------------
$$$                                =00000000    324    (2)
$$M                                =00000007    677    (2)     406    (2)     615    (2)     633    (2)     648    (2)
                                                                666    (2)     677    (2)
$$N                                =00000001    677    (2)     615    (2)     633    (2)     648    (2)     666    (2)
                                                                677    (2)      78    (2)
$$S                                =FFFFFFFF    736    (2)     324    (2)     406    (2)
$ENV                               =00000001    144    (2)
$ER                                =FFFFFFFF    736    (2)   #-615    (2)   #-633    (2)   #-648    (2)   #-666    (2)
                                                              #-677    (2)
$MO                                =00000001    738    (2)     738    (2)
$ST                                =00000000    736    (2)     406    (2)     615    (2)     633    (2)     648    (2)
                                                                666    (2)     677    (2)     736    (2)
$TN                                =0000000B    738    (2)     324    (2)     406    (2)     615    (2)     633    (2)
                                                                648    (2)     666    (2)     677    (2)     736    (2)
                                                                738    (2)
ABORTS                              000002A9-R  686    (2)   #-616    (2)   #-634    (2)   #-649    (2)   #-667    (2)
ACTUAL_EXCEPT                       00000000-XR              #-615    (2)   #-633    (2)   #-648    (2)   #-666    (2)
                                                              #-677    (2)
ACTUAL_PCB                          00000000-XR              #-543    (2)   #-547    (2)   #-549    (2)   #-551    (2)
                                                              #-659    (2)   #-670    (2)
ACTUAL_PSL                          00000000-XR                597    (2)
ACTUAL_REG                          00000000-XR                585    (2)
ALL                                =00000008    78     (2)
BACK                                00000045-R  418    (2)     434    (2)
BASE_011                            00000000-R  324    (2)     406    (2)
BIT...                             =00000002    144    (2)     110    (2)     116    (2)     144    (2)      74    (2)
CEP_FUNCTIONAL                     =00000000    144    (2)
CEP_REPAIR                         =00000001    144    (2)     144    (2)
CHECK_STACK                         00000000-XR              #-479    (2)   #-607    (2)
CHECK_STK                           00000091-R  466    (2)
CHK_1                               000000A3-R  204    (2)     615    (2)
CHK_2                               000000CC-R  205    (2)     633    (2)
CHK_21                              000000F2-R  206    (2)     648    (2)
CHK_PC                              0000011F-R  207    (2)     666    (2)
CHK_PSL                             00000145-R  208    (2)     677    (2)
CHK_STK_2                           000000B6-R  490    (2)   #-479    (2)
CHK_STK_3                           000001C1-R  624    (2)   #-608    (2)
CHK_STK_RSLT                        0000017D-R  593    (2)
CPU$V_COMET                        =00000002    74     (2)
CPU$V_HS                           =00000000    74     (2)
CPU$V_STAR                         =00000001    74     (2)
DATA_011                            00000018-R  406    (2)     406    (2)
DEFAULT                            =00000000    78     (2)     406    (2)
DS$BREAK                            00000000-XR                736    (2)
DS$CLRVEC                           00000000-XR                429    (2)     523    (2)     717    (2)
DS$ERRHARD                          00000000-XR                615    (2)     633    (2)     648    (2)     666    (2)
                                                                677    (2)
DS$SETVEC                           00000000-XR                413    (2)     516    (2)     707    (2)
DSA$AL_APTMAIL                      0000FE00    74     (2)
DSA$AT_APTTXT                       0000FA00    74     (2)
```

```
DSA$GL_APTCOM                        0000FE04      74       (2)
DSA$GL_DEVLEN                        0000FE58      74       (2)
DSA$GL_ERRNO                         0000FE44      74       (2)
DSA$GL_EVENT                         0000FE48      74       (2)
DSA$GL_FLAGS                         0000FE00      74       (2)
DSA$GL_MSGTYP                        0000FE40      74       (2)
DSA$GL_PASSES                        0000FE08      74       (2)
DSA$GL_PASSNO                        0000FE54      74       (2)
DSA$GL_SECTNO                        0000FE10      74       (2)
DSA$GL_SID                           0000FE14      74       (2)
DSA$GL_SUBTNO                        0000FE4C      74       (2)
DSA$GL_TESTNO                        0000FE50      74       (2)
DSA$GL_UNITS                         0000FE0C      74       (2)
DSA$GQ_MSGPTR                        0000FE68      74       (2)
DSA$GT_DEVNAM                        0000FE5C      74       (2)
DSA$M_APT                           =80000000      74       (2)
DSA$M_BELL                          =00000008      74       (2)
DSA$M_BINARY                        =00000002      74       (2)
DSA$M_CRD_AUTOTEST                  =00000800      74       (2)
DSA$M_CRD_MENUTEST                  =00010000      74       (2)
DSA$M_CRD_TRACE                     =00020000      74       (2)
DSA$M_DEBUG                         =04000000      74       (2)
DSA$M_HALT                          =00000001      74       (2)
DSA$M_IE1                           =00000010      74       (2)
DSA$M_IE2                           =00000020      74       (2)
DSA$M_IE3                           =00000040      74       (2)
DSA$M_IES                           =00000080      74       (2)
DSA$M_LOAD_DEBUGGER                 =40000000      74       (2)
DSA$M_LOOP                          =00000004      74       (2)
DSA$M_NORPT                         =08000000      74       (2)
DSA$M_OPER                          =00001000      74       (2)
DSA$M_PASS0                         =20000000      74       (2)
DSA$M_PROMPT                        =00002000      74       (2)
DSA$M_QA                            =00008000      74       (2)
DSA$M_QUICK                         =00000100      74       (2)
DSA$M_SEARCH                        =00004000      74       (2)
DSA$M_TRACE                         =00000400      74       (2)
DSA$M_USER                          =10000000      74       (2)
DSA$M_VERIFY                        =00000200      74       (2)
DSA$V_APT                           =0000001F      74       (2)
DSA$V_BELL                          =00000003      74       (2)
DSA$V_BINARY                        =00000001      74       (2)
DSA$V_CRD_AUTOTEST                  =0000000B      74       (2)
DSA$V_CRD_MENUTEST                  =00000010      74       (2)
DSA$V_CRD_TRACE                     =00000011      74       (2)
DSA$V_DEBUG                         =0000001A      74       (2)
DSA$V_HALT                          =00000000      74       (2)
DSA$V_IE1                           =00000004      74       (2)
DSA$V_IE2                           =00000005      74       (2)
DSA$V_IE3                           =00000006      74       (2)
DSA$V_IES                           =00000007      74       (2)
DSA$V_LOAD_DEBUGGER                 =0000001E      74       (2)
DSA$V_LOOP                          =00000002      74       (2)
DSA$V_NORPT                         =0000001B      74       (2)
DSA$V_OPER                          =0000000C      74       (2)
DSA$V_PASS0                         =0000001D      74       (2)
DSA$V_PROMPT                        =0000000D      74       (2)
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DSA$V_QA                       =0000000F    74    (2)
DSA$V_QUICK                    =00000008    74    (2)
DSA$V_SEARCH                   =0000000E    74    (2)
DSA$V_TRACE                    =0000000A    74    (2)
DSA$V_USER                     =0000001C    74    (2)
DSA$V_VERIFY                   =00000009    74    (2)
ENDS                            000002AD-R  692   (2)    #-656    (2)    #-672    (2)
END_HANDLR                      000002E8-R  716   (2)      707    (2)
END_TEST                        00000305-R  734   (2)    #-423    (2)
ENV$M_DOMAIN                   =00000002    144   (2)
ENV$M_LEVEL                    =00000001    144   (2)
ENV$M_SUPER                    =000003FC    144   (2)
ENV$S_DOMAIN                   =00000001    144   (2)
ENV$S_LEVEL                    =00000001    144   (2)
ENV$S_SUPER                    =00000008    144   (2)
ENV$V_DOMAIN                   =00000001    144   (2)      144    (2)
ENV$V_LEVEL                    =00000000    144   (2)      144    (2)
ENV$V_SUPER                    =00000002    144   (2)
ENV$_CPU                       =00000000    144   (2)      144    (2)
ENV$_FUNCTIONAL                =00000000    144   (2)      144    (2)
ENV$_REPAIR                    =00000001    144   (2)      144    (2)
ENV$_SUPER                     =00000001    144   (2)
ENV$_SYSTEM                    =00000001    144   (2)      144    (2)
EXECUTE                         00000075-R  442   (2)
EXIT                            000002B0-R  697   (2)    #-687    (2)
EXPECTED_EXCEPT                 00000000-XR                555    (2)    #-615    (2)    #-633    (2)    #-648    (2)
                                                         #-666    (2)    #-677    (2)
EXPECT_REG                      00000000-XR              #-237    (2)    #-240    (2)    #-242    (2)    #-245    (2)
                                                         #-248    (2)    #-287    (2)    #-291    (2)    #-295    (2)
HALT                           =00000004    78    (2)
HANDLER                         00000000-XR                557    (2)      574    (2)
INIT_HNDLR                      00000060-R  428   (2)      413    (2)
INIT_PC                         00000074-R  184   (2)    #-503    (2)    #-524    (2)
INIT_PSL                        00000070-R  182   (2)    #-467    (2)      469    (2)      485    (2)      491    (2)
                                                         #-525    (2)
INIT_REG                        00000000-XR                497    (2)
INST_SP                         00000078-R  186   (2)    #-539    (2)    #-627    (2)
IPR                            =00000006    78    (2)
ISTK_HNDLR                      000000F4-R  522   (2)      516    (2)
LDPCTX                         =0000000B    78    (2)      406    (2)
LDPCTX_PC                       00000111-R  536   (2)      503    (2)
LD_PC                           00000153-R  564   (2)    #-551    (2)    #-556    (2)
LOOP                            0000020A-R  300   (2)    #-301    (2)
L_END                           00000201-R  638   (2)    #-617    (2)    #-628    (2)
MANUAL                         =00000001    78    (2)
MCHK                           =00000005    78    (2)
MEM                            =00000009    78    (2)
MODE                            00000000-XR              #-468    (2)
MSG_011                         00000002-R  324   (2)      406    (2)
NONE                            00000089-R  192   (2)      555    (2)
NULL                            0000007C-R  188   (2)    #-615    (2)    #-633    (2)    #-648    (2)    #-666    (2)
                                                         #-677    (2)
OPR_ABORT                       00000000-XR              #-639    (2)
POWER                          =00000003    78    (2)
PR$S_SID_ECO                   =00000009    76    (2)
PR$S_SID_PL                    =00000003    76    (2)
PR$S_SID_SN                    =0000000C    76    (2)
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PR$S_SID_TYPE                  =00000008     76      (2)
PR$V_SID_ECO                   =0000000F     76      (2)
PR$V_SID_PL                    =0000000C     76      (2)
PR$V_SID_SN                    =00000000     76      (2)
PR$V_SID_TYPE                  =00000018     76      (2)
PR$_ACCR                       =00000029     76      (2)
PR$_ACCS                       =00000028     76      (2)
PR$_ASTLVL                     =00000013     76      (2)    #-260     (2)     #-312     (2)
PR$_CADR                       =00000025     76      (2)
PR$_CAER                       =00000027     76      (2)
PR$_CMIERR                     =00000017     76      (2)
PR$_CRBT                       =00000043     76      (2)
PR$_CSRD                       =0000001D     76      (2)
PR$_CSRS                       =0000001C     76      (2)
PR$_CSTD                       =0000001F     76      (2)
PR$_CSTS                       =0000001E     76      (2)
PR$_CSWP                       =00000042     76      (2)
PR$_ESP                        =00000001     76      (2)    #-244     (2)     #-289     (2)     #-409     (2)     #-419     (2)
PR$_ICCS                       =00000018     76      (2)
PR$_ICR                        =0000001A     76      (2)
PR$_IPL                        =00000012     76      (2)
PR$_ISP                        =00000004     76      (2)    #-626     (2)
PR$_KSP                        =00000000     76      (2)    #-239     (2)     #-240     (2)     #-549     (2)
PR$_MAPEN                      =00000038     76      (2)
PR$_MCESR                      =00000026     76      (2)
PR$_MCTL1                      =00000044     76      (2)
PR$_MCTL2                      =00000045     76      (2)
PR$_MDCR1                      =00000049     76      (2)
PR$_MEAR                       =00000048     76      (2)
PR$_MECCR                      =0000004B     76      (2)
PR$_MEDR                       =0000004A     76      (2)
PR$_MGEN                       =00000046     76      (2)
PR$_MTBER                      =00000047     76      (2)
PR$_NICR                       =00000019     76      (2)
PR$_P0BR                       =00000008     76      (2)    #-258     (2)     #-306     (2)
PR$_P0LR                       =00000009     76      (2)    #-259     (2)     #-309     (2)
PR$_P1BR                       =0000000A     76      (2)    #-263     (2)     #-313     (2)
PR$_P1LR                       =0000000B     76      (2)    #-264     (2)     #-316     (2)
PR$_PAMACC                     =00000040     76      (2)
PR$_PAMLOC                     =00000041     76      (2)
PR$_PCBB                       =00000010     76      (2)
PR$_PME                        =0000003D     76      (2)    #-265     (2)     #-319     (2)
PR$_RXCS                       =00000020     76      (2)
PR$_RXDB                       =00000021     76      (2)
PR$_SBIER                      =00000034     76      (2)
PR$_SBIFS                      =00000030     76      (2)
PR$_SBIMT                      =00000033     76      (2)
PR$_SBIQC                      =00000036     76      (2)
PR$_SBIS                       =00000031     76      (2)
PR$_SBISC                      =00000032     76      (2)
PR$_SBITA                      =00000035     76      (2)
PR$_SBR                        =0000000C     76      (2)
PR$_SCBB                       =00000011     76      (2)
PR$_SID                        =0000003E     76      (2)
PR$_SID_TYP730                 =00000003     76      (2)
PR$_SID_TYP750                 =00000002     76      (2)
PR$_SID_TYP780                 =00000001     76      (2)
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PR$_SID_TYP7VV                 =00000004      76      (2)
PR$_SID_TYPMAX                 =00000004      76      (2)
PR$_SIRR                       =00000014      76      (2)
PR$_SISR                       =00000015      76      (2)
PR$_SLR                        =0000000D      76      (2)
PR$_SSP                        =00000002      76      (2)      #-247     (2)     #-293     (2)     #-410     (2)     #-420     (2)
PR$_TBCHK                      =0000003F      76      (2)
PR$_TBDR                       =00000024      76      (2)
PR$_TBIA                       =00000039      76      (2)
PR$_TBIS                       =0000003A      76      (2)
PR$_TODR                       =0000001B      76      (2)
PR$_TXCS                       =00000022      76      (2)
PR$_TXDB                       =00000023      76      (2)
PR$_UBRESET                    =00000037      76      (2)
PR$_USP                        =00000003      76      (2)      #-250     (2)     #-297     (2)     #-411     (2)     #-421     (2)
PR$_WCSA                       =0000002C      76      (2)
PR$_WCSD                       =0000002D      76      (2)
PRINT_ERR                       00000000-XR                      615     (2)       633     (2)       648     (2)       666     (2)
                                                                 677     (2)
PSL$C_EXEC                     =00000001      77      (2)
PSL$C_KERNEL                   =00000000      77      (2)
PSL$C_SUPER                    =00000002      77      (2)
PSL$C_USER                     =00000003      77      (2)
PSL$M_C                        =00000001      77      (2)
PSL$M_CM                       =80000000      77      (2)        77     (2)
PSL$M_CURMOD                   =03000000      77      (2)
PSL$M_DV                       =00000080      77      (2)
PSL$M_FPD                      =08000000      77      (2)        77     (2)
PSL$M_FU                       =00000040      77      (2)
PSL$M_IPL                      =001F0000      77      (2)
PSL$M_IS                       =04000000      77      (2)
PSL$M_IV                       =00000020      77      (2)
PSL$M_N                        =00000008      77      (2)
PSL$M_PRVMOD                   =00C00000      77      (2)
PSL$M_SAFBITS                  =000037FF      77      (2)
PSL$M_TBIT                     =00000010      77      (2)
PSL$M_TP                       =40000000      77      (2)        77     (2)
PSL$M_V                        =00000002      77      (2)
PSL$M_Z                        =00000004      77      (2)
PSL$S_CURMOD                   =00000002      77      (2)
PSL$S_IPL                      =00000005      77      (2)
PSL$S_PRVMOD                   =00000002      77      (2)      #-468     (2)
PSL$V_C                        =00000000      77      (2)
PSL$V_CM                       =0000001F      77      (2)
PSL$V_CURMOD                   =00000018      77      (2)
PSL$V_DV                       =00000007      77      (2)
PSL$V_FPD                      =0000001B      77      (2)
PSL$V_FU                       =00000006      77      (2)
PSL$V_IPL                      =00000010      77      (2)
PSL$V_IS                       =0000001A      77      (2)      #-485     (2)     #-491     (2)     #-596     (2)
PSL$V_IV                       =00000005      77      (2)
PSL$V_N                        =00000003      77      (2)
PSL$V_PRVMOD                   =00000016      77      (2)      #-468     (2)
PSL$V_TBIT                     =00000004      77      (2)
PSL$V_TP                       =0000001E      77      (2)
PSL$V_V                        =00000001      77      (2)
PSL$V_Z                        =00000002      77      (2)
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ZZ-ENKAX-1.3    Cross reference
ENKAXL                              Ldpctx Execute                          3-AUG-1983 13:59:59  VAX-11 Macro V03-00             Page  27
Cross reference                                                             3-AUG-1983 10:06:01  WRKD$0:[PAN.ENKAX]ENKAXL.MAR;20   (2)

PTX$K_SIZE                          00000060    117   (2)
PTX$L_AP                            00000040    100   (2)   #-299   (2)
PTX$L_ESP                           00000004    85    (2)   #-242   (2)   #-243   (2)   #-244   (2)   #-287   (2)
                                                              #-288   (2)   #-289   (2)
PTX$L_FP                            00000044    101   (2)   #-547   (2)
PTX$L_KSP                           00000000    84    (2)   #-237   (2)   #-238   (2)   #-239   (2)   #-241   (2)
                                                              #-549   (2)
PTX$L_P0BR                          00000050    104   (2)   #-258   (2)   #-306   (2)
PTX$L_P0LRASTL                      00000054    105   (2)   #-259   (2)     262   (2)     308   (2)     311   (2)
PTX$L_P1BR                          00000058    111   (2)   #-263   (2)   #-313   (2)
PTX$L_P1LRPME                       0000005C    112   (2)   #-264   (2)     267   (2)     315   (2)     317   (2)
PTX$L_PC                            00000048    102   (2)   #-551   (2)   #-659   (2)
PTX$L_PSL                           0000004C    103   (2)   #-543   (2)   #-670   (2)
PTX$L_R0                            00000010    88    (2)   #-229   (2)   #-321   (2)   #-697   (2)
PTX$L_R1                            00000014    89    (2)   #-230   (2)
PTX$L_R10                           00000038    98    (2)
PTX$L_R11                           0000003C    99    (2)
PTX$L_R2                            00000018    90    (2)     255   (2)   #-301   (2)
PTX$L_R3                            0000001C    91    (2)
PTX$L_R4                            00000020    92    (2)
PTX$L_R5                            00000024    93    (2)
PTX$L_R6                            00000028    94    (2)
PTX$L_R7                            0000002C    95    (2)
PTX$L_R8                            00000030    96    (2)
PTX$L_R9                            00000034    97    (2)
PTX$L_SSP                           00000008    86    (2)   #-245   (2)   #-246   (2)   #-247   (2)   #-291   (2)
                                                              #-292   (2)   #-293   (2)
PTX$L_USP                           0000000C    87    (2)   #-248   (2)   #-249   (2)   #-250   (2)   #-295   (2)
                                                              #-296   (2)   #-297   (2)
PTX$S_ASTLVL                       =00000003    110   (2)   #-261   (2)   #-310   (2)
PTX$S_MBZ1                         =00000002    110   (2)
PTX$S_MBZ2                         =00000005    110   (2)
PTX$S_MBZ3                         =00000009    116   (2)
PTX$S_P0LR                         =00000016    110   (2)   #-307   (2)   #-314   (2)
PTX$S_P1LR                         =00000016    116   (2)
PTX$S_PME                          =00000001    116   (2)   #-266   (2)
PTX$V_ASTLVL                       =00000018    110   (2)   #-261   (2)   #-310   (2)
PTX$V_MBZ1                         =00000016    110   (2)
PTX$V_MBZ2                         =0000001B    110   (2)
PTX$V_MBZ3                         =00000016    116   (2)
PTX$V_P0LR                         =00000000    110   (2)   #-307   (2)
PTX$V_P1LR                         =00000000    116   (2)   #-314   (2)
PTX$V_PME                          =0000001F    116   (2)   #-266   (2)   #-317   (2)
PUSH_PC                             00000081-R  190   (2)   #-567   (2)   #-659   (2)
PUSH_PSL                            00000085-R  191   (2)   #-568   (2)   #-670   (2)
PUSH_REGS                           000001DF-R  275   (2)     497   (2)     700   (2)
REG_READY                           000000BF-R  496   (2)   #-487   (2)
RETURN                              000002DF-R  710   (2)     724   (2)
SAVE_REGS                           00000168-R  213   (2)     456   (2)     585   (2)
SAVE_RESULTS                        0000016E-R  584   (2)
SCB$L_ACCESS                        00000020    75    (2)
SCB$L_ARITH                         00000034    75    (2)
SCB$L_BREAK                         0000002C    75    (2)   #-413   (2)   #-429   (2)   #-516   (2)   #-523   (2)
                                                              #-707   (2)   #-717   (2)
SCB$L_CHME                          00000044    75    (2)
SCB$L_CHMK                          00000040    75    (2)
SCB$L_CHMS                          00000048    75    (2)
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SCB$L_CHMU                       0000004C     75      (2)
SCB$L_COMPAT                     00000030     75      (2)
SCB$L_KNLSTK                     00000008     75      (2)
SCB$L_MACHCHK                    00000004     75      (2)
SCB$L_OPCCUS                     00000014     75      (2)
SCB$L_OPCDEC                     00000010     75      (2)
SCB$L_POWER                      0000000C     75      (2)
SCB$L_RADRMOD                    0000001C     75      (2)
SCB$L_ROPRAND                    00000018     75      (2)
SCB$L_RXDB                       000000F8     75      (2)
SCB$L_SFTLVL1                    00000084     75      (2)
SCB$L_SFTLVL10                   000000A8     75      (2)
SCB$L_SFTLVL11                   000000AC     75      (2)
SCB$L_SFTLVL12                   000000B0     75      (2)
SCB$L_SFTLVL13                   000000B4     75      (2)
SCB$L_SFTLVL14                   000000B8     75      (2)
SCB$L_SFTLVL15                   000000BC     75      (2)
SCB$L_SFTLVL2                    00000088     75      (2)
SCB$L_SFTLVL3                    0000008C     75      (2)
SCB$L_SFTLVL4                    00000090     75      (2)
SCB$L_SFTLVL5                    00000094     75      (2)
SCB$L_SFTLVL6                    00000098     75      (2)
SCB$L_SFTLVL7                    0000009C     75      (2)
SCB$L_SFTLVL8                    000000A0     75      (2)
SCB$L_SFTLVL9                    000000A4     75      (2)
SCB$L_TBIT                       00000028     75      (2)
SCB$L_TIMER                      000000C0     75      (2)
SCB$L_TRANSL                     00000024     75      (2)
SCB$L_TXDB                       000000FC     75      (2)
SCB$L_ZERO                       00000000     75      (2)
SEP_FUNCTIONAL                  =00000002     144     (2)
SEP_REPAIR                      =00000003     144     (2)
SIZ...                          =00000008     144     (2)      110     (2)      116     (2)      144     (2)      74      (2)
TEMP_ESP                         00000097-R   195     (2)     #-409    (2)     #-419    (2)
TEMP_LONGWORD                    0000007D-R   189     (2)     #-626    (2)     #-627    (2)
TEMP_PC                          00000060-R   179     (2)     #-452    (2)     #-711    (2)
TEMP_PSL                         00000064-R   180     (2)     #-454    (2)     #-723    (2)
TEMP_R0                          00000068-R   181     (2)     #-514    (2)     #-537    (2)     #-699    (2)     #-719    (2)
TEMP_REGS                        00000000-R   177     (2)      456     (2)     #-697    (2)      700     (2)
TEMP_SSP                         0000009B-R   196     (2)     #-410    (2)     #-420    (2)
TEMP_SV_PC                       0000008F-R   193     (2)
TEMP_SV_PSL                      00000093-R   194     (2)
TEMP_USP                         0000009F-R   197     (2)     #-411    (2)     #-421    (2)
TEST_011                         0000001C-R   406     (2)      406     (2)
TEST_011_X                       00000308-R   736     (2)
TEST_CONTROL                     00000000-XR                   431     (2)
TU58                            =00000002     78      (2)
UBI                             =0000000A     78      (2)
WCS                             =00000007     78      (2)
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                                              +-------------------------+
                                              ! Macros Cross Reference !
                                              +-------------------------+
MACRO             SIZE           DEFINITION        REFERENCES...
------            ----           ----------        -------------
$D1_BTEST         1              406    (2)       406    (2)
$D1_ERR           1              615    (2)       615    (2)       633    (2)       648    (2)       666    (2)       677    (2)
$D1_ERR_S         1              615    (2)       615    (2)       633    (2)       648    (2)       666    (2)       677    (2)
$D1_ETEST         1              736    (2)       736    (2)
$D1_SBTTL         2              324    (2)       324    (2)
$D2_BDATA         1              406    (2)       406    (2)
$D2_BTEST         1              406    (2)       406    (2)
$D2_SBTTL         1              324    (2)       324    (2)
$DEF              1              144    (2)       100    (2)       101    (2)       102    (2)       103    (2)       104    (2)
                                                  105    (2)       111    (2)       112    (2)       117    (2)       74     (2)
                                                  75     (2)       84     (2)       85     (2)       86     (2)       87     (2)
                                                  88     (2)       89     (2)       90     (2)       91     (2)       92     (2)
                                                  93     (2)       94     (2)       95     (2)       96     (2)       97     (2)
                                                  98     (2)       99     (2)
$DEFEND           1              74     (2)       118    (2)       74     (2)       75     (2)       76     (2)       77     (2)
$DEFINI           1              74     (2)       74     (2)       75     (2)       76     (2)       77     (2)       83     (2)
$DS_BGNMOD        1              144    (2)       144    (2)
$DS_BGNTEST       1              406    (2)       406    (2)
$DS_BREAK         1              736    (2)       736    (2)
$DS_CLRVEC_S      1              429    (2)       429    (2)       523    (2)       717    (2)
$DS_DSADEF        1              74     (2)       74     (2)
$DS_DSBDEF        1              74     (2)
$DS_ENDDATA       1              406    (2)       406    (2)
$DS_ENDMOD        1              738    (2)       738    (2)
$DS_ENDTEST       1              736    (2)       736    (2)
$DS_ENVDEF        2              144    (2)       144    (2)
$DS_ERRHARD_S     1              611    (2)       611    (2)       629    (2)       644    (2)       662    (2)       673    (2)
$DS_SBTTL         1              324    (2)       324    (2)
$DS_SCBDEF        1              75     (2)       75     (2)
$DS_SECDEF        1              78     (2)       78     (2)
$DS_SETVEC_S      1              413    (2)       413    (2)       516    (2)       706    (2)
$EQU              1              144    (2)       144    (2)       76     (2)       77     (2)
$EQULS1           1              144    (2)       144    (2)
$EQULST           1              144    (2)       144    (2)
$GBLINI           2              74     (2)       144    (2)       74     (2)       75     (2)       76     (2)       77     (2)
                                                  83     (2)

$PRDEF            1              76     (2)       76     (2)
$PSLDEF           1              77     (2)       77     (2)
$PTXDEF           1              118    (2)
$PUSHADR          1              615    (2)       615    (2)       633    (2)       648    (2)       666    (2)       677    (2)
$VIELD            1              74     (2)       106    (2)       113    (2)       144    (2)       74     (2)
$VIELD1           1              144    (2)       110    (2)       116    (2)       144    (2)       74     (2)
ENKAX_SECDEF      1              78     (2)       78     (2)
PUSH_R            1              134    (2)       497    (2)       700    (2)
SAVE_R            1              123    (2)       456    (2)       585    (2)
```

```
                                                   +--------------------------+
                                                   ! Performance indicators !
                                                   +--------------------------+
Phase                         Page faults    CPU Time        Elapsed Time
-----                         -----------    --------        ------------
Initialization                        21     00:00:00.06     00:00:00.18
Command processing                    29     00:00:00.21     00:00:00.55
Pass 1                               740     00:00:09.08     00:00:12.14
Symbol table sort                      0     00:00:00.49     00:00:00.50
Pass 2                               197     00:00:02.20     00:00:02.51
Symbol table output                   47     00:00:00.26     00:00:00.28
Psect synopsis output                  4     00:00:00.02     00:00:00.02
Cross-reference output                85     00:00:01.70     00:00:02.24
Assembler run totals                1127     00:00:14.06     00:00:18.44

The working set limit was 1000 pages.
66458 bytes (130 pages) of virtual memory were used to buffer the intermediate code.
There were 20 pages of symbol table space allocated to hold 365 non-local and 4 local symbols.
740 source lines were read in Pass 1, producing 23 object records in Pass 2.
70 pages of virtual memory were used to define 35 macros.

                                                  +----------------------------+
                                                  ! Macro library statistics !
                                                  +----------------------------+

Macro library name                                 Macros defined
------------------                                 --------------
WRKD$0:[PAN.ENKAX]ENKAX.MLB;72                                  1
SYS$SYSROOT:[SYSLIB]DIAG.MLB;812                               22
SYS$SYSROOT:[SYSLIB]LIB.MLB;1                                   0
SYS$SYSROOT:[SYSLIB]STARLET.MLB;1                               8
TOTALS (all libraries)                                         31

568 GETS were required to define 31 macros.

There were no errors, warnings or information messages.

/LIS/CRO ENKAXL
```

Fiche	Frame	Sequence		
1	B1	1	Documentation	
1	I6	73	Map	
1	E7	82		4-AUG-1983
1	F7	83	VAX 11/730 Specific CPU Cluster Exercise	4-AUG-1983
1	G7	84	ENKAX1: HEADER MODULE	4-AUG-1983
1	H7	85	DECLARATIONS	4-AUG-1983
1	K7	88	Program Header Data Block	4-AUG-1983
1	L7	89	Dispatch Table	4-AUG-1983
1	M7	90	Program Global Data Section	4-AUG-1983
1	N7	91	Program Text Section	4-AUG-1983
1	D8	94	Initialization Procedure	4-AUG-1983
1	H8	98	Clean-up Procedure	4-AUG-1983
1	J8	100	Summary Report Procedure	4-AUG-1983
1	L8	102	Summary Information Block Initialization	4-AUG-1983
1	N8	104	Summary Information Input Subroutine	4-AUG-1983
1	C9	106	Symbol table	4-AUG-1983
1	J9	113	Cross reference	4-AUG-1983
1	M10	129		3-AUG-1983
1	N10	130	VAX-11/730 Specific CPU Cluster Exercise	3-AUG-1983
1	B11	131	DECLARATIONS	3-AUG-1983
1	C11	132	Data Tables	3-AUG-1983
1	E11	134	ERROR MESSAGES	3-AUG-1983
1	G11	136	SUBROUTINES AND SERVICE ROUTINES	3-AUG-1983
1	H11	137	TEST 1: Reserved Processor Registers	3-AUG-1983
1	I11	138	SUBTEST 1.1: Reserved Processor Registe	3-AUG-1983
1	K11	140	SUBTEST 1.2: Read only Processor Regist	3-AUG-1983
1	M11	142	SUBTEST 1.3: Write Only Processor Regis	3-AUG-1983
1	B12	144	Symbol table	3-AUG-1983
1	D12	146	Psect synopsis	3-AUG-1983
1	E12	147	Cross reference	3-AUG-1983
1	M12	155		30-JUN-1983
1	N12	156	VAX-11/730 Specific CPU Cluster Exercise	30-JUN-1983
1	B13	157	DECLARATIONS	30-JUN-1983
1	C13	158	TEST 2: UNPREDICTABLE Results	30-JUN-1983
1	D13	159	SUBTEST 2.1: Writes to the Instruction	30-JUN-1983
1	E13	160	SUBTEST 2.2: Register Mode Addressing I	30-JUN-1983
1	F13	161	SUBTEST 2.3: Addressing Mode (PC) and -	30-JUN-1983
1	G13	162	SUBTEST 2.4: Addressing Modes 6, 7, or	30-JUN-1983
1	H13	163	SUBTEST 2.5: Floating Point Data Used a	30-JUN-1983
1	I13	164	SUBTEST 2.6: FPD Set by the Program	30-JUN-1983
1	J13	165	SUBTEST 2.7: Clearing TP and not T	30-JUN-1983
1	K13	166	SUBTEST 2.8: Referrences to the Current	30-JUN-1983
1	M13	168	Symbol table	30-JUN-1983
1	B14	170	Psect synopsis	30-JUN-1983
1	C14	171	Cross reference	30-JUN-1983
1	J14	178		3-AUG-1983
1	K14	179	VAX-11/730 Specific CPU Cluster Exercise	3-AUG-1983
1	L14	180	ENKAXC: POWER FAIL	3-AUG-1983
1	M14	181	DECLARATIONS	3-AUG-1983
1	N14	182	INSTRUCTION MESSAGES	3-AUG-1983
1	C15	184	ERROR MESSAGES	3-AUG-1983
1	D15	185	SUBROUTINES	3-AUG-1983
1	H15	189	TEST 2: POWER FAIL	3-AUG-1983
1	I15	190	SUBTEST 2.1: GOOD RPB SUBTEST	3-AUG-1983
1	K15	192	SUBTEST 2.2: SEARCH FOR GOOD RPB	3-AUG-1983
1	M15	194	SUBTEST 2.3: BAD CHECKSUM SUBTEST	3-AUG-1983
1	B16	196	Symbol table	3-AUG-1983

Fiche	Frame	Sequence		
1	E16	199	Cross reference	3-AUG-1983
2	C1	208		3-AUG-1983
2	D1	209	VAX-11/730 Specific CPU Cluster Exercise	3-AUG-1983
2	E1	210	ENKAXD: PROCESSOR HALT	3-AUG-1983
2	F1	211	DECLARATIONS .LIST MEB	3-AUG-1983
2	H1	213	INSTRUCION MESSAGES	3-AUG-1983
2	I1	214	ERROR MESSAGES	3-AUG-1983
2	B2	220	DATA TABLES	3-AUG-1983
2	F2	224	SUBROUTINES	3-AUG-1983
2	I2	227	TEST 3: PROCESSOR HALTS ARCH. DEFINED	3-AUG-1983
2	K2	229	SUBTEST 3.1: HALT Inst. in Kernel Mode	3-AUG-1983
2	M2	231	SUBTEST 3.2: Interrupt Stack invalid	3-AUG-1983
2	E3	236	SUBTEST 3.3: IS SP points to NXM	3-AUG-1983
2	H3	239	SUBTEST 3.4: CHMU inst. with PSL<IS>=1	3-AUG-1983
2	K3	242	SUBTEST 3.5: CHMS inst. with PSL<IS>=1	3-AUG-1983
2	N3	245	SUBTEST 3.6: CHME inst. with PSL<IS>=1	3-AUG-1983
2	D4	248	SUBTEST 3.7: CHMK inst. with PSL<IS>=1	3-AUG-1983
2	G4	251	TEST 4: PROCESSOR HALTS ARCH. UNDEFINED	3-AUG-1983
2	I4	253	SUBTEST 4.1: CHMU inst. with vector ser	3-AUG-1983
2	K4	255	SUBTEST 4.2: CHMS inst. with vector ser	3-AUG-1983
2	M4	257	SUBTEST 4.3: CHME inst. with vector ser	3-AUG-1983
2	B5	259	SUBTEST 4.4: CHMK inst. with vector ser	3-AUG-1983
2	D5	261	SUBTEST 4.5: Invalid vector HALT	3-AUG-1983
2	F5	263	SUBTEST 4.6: SCBB read error HALT	3-AUG-1983
2	H5	265	SUBTEST 4.7: Double machine check HALT	3-AUG-1983
2	J5	267	SUBTEST 4.8: Transfer to NXM USER WCS	3-AUG-1983
2	M5	270	Symbol table	3-AUG-1983
2	F6	276	Cross reference	3-AUG-1983
2	L7	295		30-JUN-1983
2	M7	296	VAX-11/730 Specific CPU Cluster Exercise	30-JUN-1983
2	N7	297	DECLARATIONS	30-JUN-1983
2	B8	298	SUBROUTINES	30-JUN-1983
2	D8	300	ERROR MESSAGES	30-JUN-1983
2	E8	301	TEST 5: Writable Control Store Test <NY	30-JUN-1983
2	F8	302	SUBTEST 5.1:	30-JUN-1983
2	G8	303	SUBTEST 5.2:	30-JUN-1983
2	H8	304	SUBTEST 5.3:	30-JUN-1983
2	I8	305	Symbol table	30-JUN-1983
2	M8	309	Psect synopsis	30-JUN-1983
2	N8	310	Cross reference	30-JUN-1983
2	K9	320		3-AUG-1983
2	L9	321	VAX-11/730 Specific CPU Cluster Exercise	3-AUG-1983
2	M9	322	DECLARATIONS	3-AUG-1983
2	B10	324	ERROR MESSAGES	3-AUG-1983
2	F10	328	DATA TABLES	3-AUG-1983
2	H10	330	ERROR REPORTING ROUTINE	3-AUG-1983
2	K10	333	SUBROUTINES	3-AUG-1983
2	N10	336	TEST 5: Machine Check Exceptions	3-AUG-1983
2	B11	337	SUBTEST 5.1: Reference to NXM	3-AUG-1983
2	D11	339	SUBTEST 5.2: Unaligned reference to I/O	3-AUG-1983
2	F11	341	SUBTEST 5.3: Illegal I/O space address	3-AUG-1983
2	H11	343	SUBTEST 5.4: Illegal UNIBUS reference	3-AUG-1983
2	J11	345	Symbol table	3-AUG-1983
2	B12	350	Psect synopsis	3-AUG-1983
2	C12	351	Cross reference	3-AUG-1983
2	D13	365		4-AUG-1983
2	E13	366	VAX-11/730 Specific CPU Cluster Exercise	4-AUG-1983

Fiche	Frame	Sequence		
2	F13	367	ENKAXG: TU58 EXERCISER	4-AUG-1983
2	G13	368	DECLARATIONS	4-AUG-1983
2	H13	369	Symbol table	4-AUG-1983
2	I13	370	Cross reference	4-AUG-1983
2	K13	372		3-AUG-1983
2	L13	373	VAX-11/730 Specific CPU Cluster Exercise	3-AUG-1983
2	M13	374	DECLARATIONS	3-AUG-1983
2	E14	379	DATA TABLES	3-AUG-1983
2	I14	383	ERROR MESSAGES	3-AUG-1983
2	G15	394	ERROR REPORTING ROUTINES	3-AUG-1983
2	M15	400	SUBROUTINES	3-AUG-1983
2	G16	407	TEST 8: UNIBUS Functional Test	3-AUG-1983
2	H16	408	SUBTEST 8.1: CSR	3-AUG-1983
2	K16	411	SUBTEST 8.2: Map Data Bus	3-AUG-1983
3	C1	414	SUBTEST 8.3: Map Address Bus	3-AUG-1983
3	E1	416	SUBTEST 8.4: Map Entry	3-AUG-1983
3	H1	419	SUBTEST 8.5: CPU Read/Write	3-AUG-1983
3	L1	423	SUBTEST 8.6: Interrupts	3-AUG-1983
3	C2	427	SUBTEST 8.7: DATI 1	3-AUG-1983
3	F2	430	SUBTEST 8.8: Map Select	3-AUG-1983
3	J2	434	SUBTEST 8.9: DATI 2	3-AUG-1983
3	L2	436	SUBTEST 8.10: DATO	3-AUG-1983
3	B3	439	SUBTEST 8.11: DATOB	3-AUG-1983
3	E3	442	SUBTEST 8.12: DATIP/DATO	3-AUG-1983
3	H3	445	SUBTEST 8.13: Address Offset DATI	3-AUG-1983
3	K3	448	SUBTEST 8.14: Address Offset DATO	3-AUG-1983
3	N3	451	SUBTEST 8.15: Address Offset DATOB	3-AUG-1983
3	D4	454	SUBTEST 8.16: Address Offset DATIP/DATO	3-AUG-1983
3	G4	457	SUBTEST 8.17: Map Function	3-AUG-1983
3	J4	460	SUBTEST 8.18: Address Offset Map Functi	3-AUG-1983
3	M4	463	SUBTEST 8.19: Page Boundary Write Error	3-AUG-1983
3	B5	465	SUBTEST 8.20: Map Parity Error	3-AUG-1983
3	D5	467	SUBTEST 8.21: NXM Error	3-AUG-1983
3	F5	469	SUBTEST 8.22: Map Invalid	3-AUG-1983
3	H5	471	TEST 9: UBE Multi-transfer Test	3-AUG-1983
3	J5	473	SUBTEST 9.1: UBE Multi-transfer 1	3-AUG-1983
3	B6	478	SUBTEST 9.2: UBE Multi-transfer 2	3-AUG-1983
3	F6	482	Symbol table	3-AUG-1983
3	M6	489	Psect synopsis	3-AUG-1983
3	N6	490	Cross reference	3-AUG-1983
3	N8	516		3-AUG-1983
3	B9	517	VAX-11/730 Specific CPU Cluster Exercise	3-AUG-1983
3	C9	518	ENKAXI: MEMORY TEST	3-AUG-1983
3	D9	519	DECLARATIONS	3-AUG-1983
3	F9	521	ERROR MESSAGES	3-AUG-1983
3	H9	523	DATA TABLES	3-AUG-1983
3	K9	526	ERROR REPORTING ROUTINES	3-AUG-1983
3	L9	527	SUBROUTINES	3-AUG-1983
3	N9	529	TEST 10: Memory	3-AUG-1983
3	B10	530	SUBTEST 10.1: Memory Size	3-AUG-1983
3	D10	532	SUBTEST 10.2: Data Path	3-AUG-1983
3	F10	534	SUBTEST 10.3: Memory March	3-AUG-1983
3	J10	538	Symbol table	3-AUG-1983
3	B11	543	Cross reference	3-AUG-1983
3	N11	555		4-AUG-1983
3	B12	556	VAX-11/730 Specific CPU Cluster Exercise	4-AUG-1983
3	C12	557	DECLARATIONS	4-AUG-1983

Fiche	Frame	Sequence		
3	D12	558	Symbol table	4-AUG-1983
3	E12	559	Cross reference	4-AUG-1983
3	G12	561		4-Aug-1983
3	H12	562	ENKAX Privileged Instruction Ldpctx	4-Aug-1983
3	K14	591	Ldpctx Execute	3-AUG-1983
3	N14	594	DECLARATIONS	3-AUG-1983
3	D15	597	<Subroutines>	3-AUG-1983
3	G15	600	TEST 11: Load Process Context	3-AUG-1983
3	C16	609	Symbol table	3-AUG-1983
3	G16	613	Cross reference	3-AUG-1983